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MACROINVERTEBRATE INVENTORIES OF THE WHITE RIVER, COLORADO AND UTAH
Significance of Annual, Seasonal, and Spatial Variation in the Design of Biomonitoring Networks for Pollution Detection

by

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ABSTRACT

An aquatic macroinvertebrate monitoring program is suggested for "early warning" detection of toxic discharges to streams in oil shale development areas. Changes in stream biota are used to signal need for increasing levels of chemical analyses to identify and quantify toxic pollutants. This study compiles invertebrate data taken during three seasons (spring, summer and fall) and over five years (1976 to 1980) from riffles along the White River in Colorado and Utah. Spatial and temporal variations in the biota are described along with their implications for the development of a monitoring system that incorporates such comparative surveys. In addition, the data provide benthic biological information that is generally comparable to previous studies on the White River and which can be used to expand the biological monitoring data base prior to commercial scale oil shale development.

CONTENTS

Abstract iii
Figures v
Tables vi
Introduction 1
Conclusions 3
Study Area 5
Methods 7
    Sampling Sites and Survey Design 7
    Field Methods 9
    Sample Processing 9
Results 11
    Annual Variation 11
    Seasonal Changes 13
    Short-Term Temporal Variation 13
    Faunal Changes along River 16
Incorporation of Macroinvertebrate Data into an Integrated Monitoring Program 16
References 22

FIGURES

Number Page

1 Approximate locations of biological sampling stations in the White River, Utah and Colorado, 1976 to 1980 6

2 Relative abundances (percentages) of common mayfly species collected from sites 130 and 140 during the fall of each year from 1976 through 1979 12

3 Seasonal variation exhibited by individual mayfly species and by major insect groups in 1978 collection from site 114 14

4 Short-term variation exhibited by individual mayfly species and by major insect groups in 1978 collections from sites 30 and 130 15

5 Variation along river in mean count per replicate for selected mayflies, stoneflies, and caddisflies (September 1979 collections) 17

6 Variation along river in mean count per replicate for selected caddisflies and riffle beetles (September 1979 collections) . . 18

TABLES

Number Page

1 Seasons and Years of Macroinvertebrate Collections Processed from White River Sampling Sites 8

2 Suggestions for Using Community Change to Establish Monitoring Requirements 19

INTRODUCTION

Development of oil shale and coal resources in the western United States will increase the potential for contamination of water resources with a host of pollutants including a myriad of inorganic and organic toxic substances. Properly safeguarding western surface water resources may require an "early-warning" monitoring network for the timely detection and location of toxic substances. To approach such a task on a broad scale through strictly chemical monitoring is probably not feasible. The long list of inorganic and organic constituents identified as energy related waste effluent components (Pellizzari 1978) makes extensive use of comprehensive chemical analyses prohibitively expensive. Intensive chemical monitoring of waterways will therefore likely be limited to selected locations where the potential for toxic contaminants is highest, such as stream sites in close proximity to mining and processing activities. However, the possibility of impacts at other less obvious sites exists, mainly as a result of subsurface transport, spills, and surface runoff during storms.

As a means of expanding surveillance coverage of potentially impacted streams, an approach incorporating biological monitoring is suggested. The approach includes analysis of changes in stream biota as a means of detecting subtle pollution impacts resulting from low-level toxicant release to the stream. When unexpected or unacceptable biological changes found at a stream site indicate a hazard may exist, chemical analyses can be employed to identify and quantify the substance(s). This method of coupling biological "early-warning" surveys with follow-up chemical analyses, permits efficient monitoring of entire stream systems for toxic pollutants.

The stream biological monitoring method suggested uses the pollution sensitivity of aquatic insects and other macroinvertebrates that inhabit rocky substrates of stream riffles. The relatively large number of bottom-dwelling invertebrates normally available for easy collection assures adequate numbers will be sampled to provide reliable data. Invertebrates are relatively stationary as compared to fish, and they have been demonstrated to respond in a measurable way to even very slight and periodic pollutant leakages to the environment (Hynes 1960). Severe toxic impacts will cause general mortality among invertebrates. More commonly, pollutants will cause community composition changes resulting from sensitivity differences among taxa to low level pollutants. These biological responses are detectable through measurements of changes in invertebrate community composition and structure.

Biological monitoring of this type can be considered a form of *in situ* exposure assessment, where invertebrates are the receptors being assessed. Benthic biomonitoring has been used in pollution assessment for decades, chiefly in eastern North America and Europe, and is sensitive to cumulative and interactive effects which chemical monitoring may fail to detect. However, sufficient information has not been acquired through field and laboratory studies to realize the full potential of this approach, specifically with respect to detecting potentially toxic pollutants resulting from western oil shale and other energy related development.

Comparative faunal surveys have been demonstrated to most effectively detect pollution impacts when natural variation of the biota is well documented. This assures that "false alarms" will be minimized while, at the same time, the effects of toxic impacts will not be mistaken for naturally occurring biotic fluctuations.

This study compiles invertebrate data taken during three seasons (spring, summer, and fall) over five years (1976 to 1980) from riffles along the White River in Colorado and Utah. Spatial and temporal biologic variation are described along with their implications for developing a monitoring system that incorporates such comparative surveys. In addition, these data provide benthic biological information generally comparable to previous studies on the White River (Ames 1977), which can be used to expand the biological monitoring data base prior to commercial scale oil shale development.

CONCLUSIONS

- Community changes can only be distinguished from naturally occurring variations if resident fauna are well documented.

- Although annual (year to year) variations in White River biota can be very substantial, these changes are generally consistent between adjacent collection sites with similar habitats. Thus, between-site faunal comparisons offer good reliability for detecting impacts originating in a stream reach bracketed by adjacent upstream-downstream sites. With this consideration, incorporating the biomonitoring survey method into a western streams' monitoring program, as illustrated, is feasible.

- Short-term variability found in White River biota dictates that when several sites are sampled they must be sampled as close to the same date as possible.

- Criteria for site selection must include the degree of longitudinal (site to site) variability of stream biota being surveyed and locations of areas of highest potential for toxic introductions. Stream biota in the middle reaches of the White River (between Rangely and Meeker, Colorado) change only gradually. Consequently, collection sites need only be established in the vicinity of potential pollutant sources (e.g., disposal piles, tributaries, subsurface seeps).

- Sampling frequency will depend on the importance placed on early detection of water quality deterioration. However, seasonal progression of stream invertebrate communities dictates a minimum of one sampling each spring, summer, and fall. Rates of recolonization of impacted substrates by drift from unimpacted areas upstream may, however, dictate more frequent sampling (e.g., monthly or every two months).

- Measurement of conventional water quality parameters and chemical analyses of selected invertebrates and sediments may aid identification and assessment of toxicants discharged intermittently, or which are below detectable levels in water-column analysis. These measurements also assist identification of non-toxic factors that may cause community shifts (e.g., low dissolved oxygen, temperature shifts, etc.).

- If field surveys indicate the toxic pollutants have substantially altered macroinvertebrate communities supplemental field and laboratory toxicity tests are recommended to assess the sensitivities of common White River species exposed to suspected pollutants. This information facilitates correct interpretation of survey results for detection and assessment of pollutant effects.

- The stream biota survey approach is suggested for detecting and assessing water quality changes in western lands as they open to development. Continued experience with its use in such a context will result in technique refinement thereby increasing efficiency of the approach.

STUDY AREA

The study area is a 200-km section of the White River in Utah and Colorado (Figure 1). Sampling site distributions provide good representation of riffle environments along the river. The White is representative of larger streams flowing out of the Rocky Mountains and across semi-arid lands of the western United States to the Colorado River. Peak flows occur during May or June with low flows generally occurring during September. Annual discharge at Meeker averages about 18 m^3/s (USGS 1964), with 7-day, 10-year low and high flows of 5.4 and 108.6 m^3/s (Fox 1977). Seasonal changes include ice cover during winter and a large flow increase in late spring from mountain snowmelt. Upper reaches from Trappers Lake (el. 2925 m) to Meeker (el. 1944 m) comprise an excellent trout stream with clear, cold, mountain waters and a stable substrate supporting a rich and diverse invertebrate fauna (Hornig and Pollard 1978). Downstream from Meeker the stream becomes increasingly turbid as it travels past Rangely at 1607 m elevation to its confluence with the Green River at an elevation of 1460 m. Downstream, trout are replaced by warm-water fish and the substrate becomes less stable and more choked with debris and fine sediments. These middle and lower reaches are periodically impacted by severe summer flooding and sediment scouring caused by localized thunderstorms and runoff from the sparsely-vegetated watershed.

The White River watershed is relatively undisturbed by man's activities. There are no impoundments (unusual for the Colorado River Basin) and only two small towns located on the river; Rangely and Meeker, Colorado. There is some farming and considerable rangeland use within the watershed. Industrialization in the form of oil shale mining and processing has recently begun within this watershed and is expected to greatly expand over the next few years. Developmental activities are now underway on Yellow Creek and Piceance Creek watersheds, both White River tributaries (Figure 1). Commercial-scale production is expected within the decade. Oil shale deposits are also found in the immediate vicinity of the White River in Utah's Uinta Basin where areas have been identified for future development.

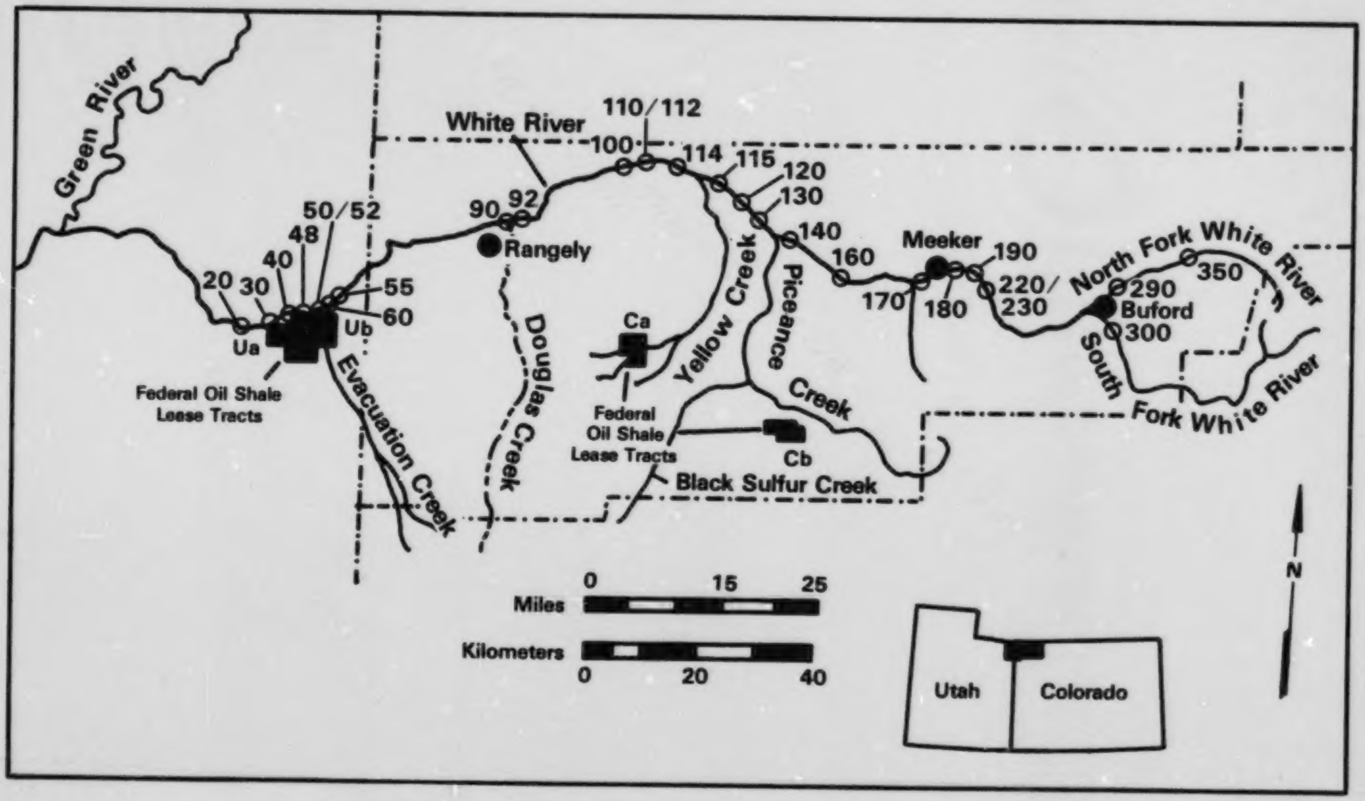
Green River
White River
110/112
100
114
115
120
130
140
160
170
180
190
220/
230
Meeker
North Fork White River
290
350
Buford
300
South Fork White River
90
92
Rangely
50/52
48
40
30
20
55
60
Ua
Ub
Federal Oil Shale Lease Tracts
Evacuation Creek
Douglas Creek
Ca
Federal Oil Shale Lease Tracts
Yellow Creek
Piceance Creek
Cb
Black Sulfur Creek
Miles
0
15
25
Kilometers
0
20
40
Utah
Colorado
N

Figure 1. Approximate locations of biological sampling stations in the White River, Utah and Colorado, 1976 through 1979.

METHODS

SAMPLING SITES AND SURVEY DESIGN

Sampling sites were restricted to stream riffles. Relatively high riffle biota diversity increases information available for detecting fauna alterations. High density of riffle organisms also enables easy collection of large numbers of invertebrates.

A total of 74 invertebrate sample sets from 27 White River collection sites and 11 different collection times were processed. These collections represent from 3 to 15 replicate samples each, with the majority consisting of five replicates. Approximate locations of sampling sites are provided in Figure 1. Table 1 shows seasons and years collections were taken from each site. Collection locations were designed to identify three sources of natural faunal variation: (1) temporal (annual, seasonal, and short-term) changes at specific collection sites; (2) spatial (longitudinal) changes along the White River on specific dates; and (3) annual changes in the degree of similarity between adjacent collection sites.

For purposes of examing annual variation, fall was the best documented season. Collections were taken in September or early October during four consecutive years (1976 to 1979). April collections were taken for three years, (1978 to 1980), to document changes in spring biota. Summer biota were sampled during late July and early August, 1978 and 1979.

Collections from spring, summer, and fall of both 1978 and 1979 documented seasonal changes within a given year. Invertebrate data were also compared over shorter time intervals (early versus late September 1976 and April versus May 1978) to examine within-season changes. These within-year data were collected partly to provide information useful for optimizing sampling frequencies.

The September 1979 sample sets were taken from 16 separate sites, providing this study's most extensive documentation of longitudinal changes in communities. At other collection times the number of sites sampled ranged from two to twelve.

The third source of variation, i.e. changes in degree of similarity between adjacent sites, is particularly relevant for detecting toxic discharges. To detect and locate a source of pollution, the degree of similarity of the biota collected from adjacent sites must be assessed. There will be some natural (baseline) between-site differences resulting from small changes in habitat and any existent influences that expected to vary somewhat from year to year. However, when between-site faunal differences exceed that attributable to natural variation, the impact such as could be caused by a toxic discharge originating between the sites may be suspected. With this consideration, particular emphasis was given to the pair of sites located just upstream

TABLE 1. SEASONS AND YEARS OF MACROINVERTEBRATE COLLECTIONS PROCESSED FROM WHITE RIVER SAMPLING SITES

	Year and Season of Collections										
Collection Site[1]	Fall[2] 1976		Fall 1977	Spr.[3] 1978		Sum. 1978	Fall 1978	Spr. 1979	Sum. 1979	Fall 1979	Spr. 1980
Downstream Reaches											
20	X										
30	X	X	X								
40	X										
48		X									
50	X										
52		X									
55										X	
60	X	X	X				X			X	
Middle Reaches											
90			X	X		X	X			X	
92										X	
100										X	
110										X	
112						X					
114					X	X	X		X	X	X
115					X	X	X		X	X	X
120										X	
130		X	X	X	X	X	X	X	X	X	X
140		X	X	X	X	X	X	X	X	X	X
160										X	
170	X									X	
Upstream Reaches											
180			X							X	
190	X										
220	X										
230			X	X	X	X	X			X	
290			X				X			X	
300			X								
350							X				

[1] See Figure 1 for location of collection sites.

[2] First column represents early September 1976 and second column represents late September 1976.

[3] First column represents April 1978 and second column represents May 1978.

and down-stream from two White River tributaries, the watersheds of which contain areas of on-going oil shale development. These are sites 130 and 140 and sites 114 and 115, which bracket the confluences of Piceance and Yellow Creeks, respectively (Figure 1).

FIELD METHODS

All data sets presented in this report were obtained using the Standardized Traveling Kick Method (STKM) described by Hornig and Pollard (1978), Pollard and Kinney (1979), Kinney et al. (1980) and Pollard (1981). Netting used for the September 1976 collections was Nitex™ 423 (approximately 40 mesh) while that used for all other collections was Nitex™ 571 (approximately 30 mesh). It is assumed that this small difference in mesh size does not greatly affect comparability of data, particularly since all the samples including those from September 1976, were rinsed thoroughly in the laboratory through Nitex™ 571 netting. All replicates were collected for a standardized time of 15, 30, or 60 seconds with areal coverage of 1.5, 3, or 6 m^2. Replicates from site 130 in May 1978, were collected for a period of 15 seconds each, and those from sites 180, 230, 290, and 300 in October 1977, were collected for 60 seconds each. Investigations which directly compared the 30-second and 15-second STKM samples taken from site 130 in September 1978, showed percentage composition data do not differ significantly according to the time interval employed (Pollard 1981). STKM collections recorded here were taken by several investigators. However, investigator differences using the STKM method on the White River have also been shown to be largely insignificant in terms of percentage composition of taxa (Pollard 1981). In general, a minor amount of variation in the method attributable to different sampling personnel does not greatly alter estimates of invertebrate composition.

SAMPLE PROCESSING

Samples were preserved in the field with formalin and individually stored in mason jars. In the laboratory the formalin was thoroughly rinsed from each sample through a mason jar ring fitted with 571 Nitex™ netting. Debris and organisms were then separated from gravel in the sample by floatation and spread into a white enamel pan where organisms were hand-sorted from debris for subsequent identification and enumeration. Residual debris of a randomly chosen replicate from each sample set was resorted as a quality control check. If >10 percent of the total number of animals originally extracted from the sample were found, the entire sample set was resorted.

Only one-fourth or one-half each of many of the large replicates (containing >500 organisms) were processed. Counts from all these subsampled replicates were corrected for subsampling; hence all data presented can be directly compared in terms of counts per complete replicate.

Identification of most groups of invertebrates was carried out to the lowest taxonomic level possible from available literature. This was normally to the generic or species level. Midges and black flies were not initially identified beyond the family level. However, identification of chironomids to genus level is currently underway. Chironomidae are a particularly diverse and abundant group in the White River, and identification of those collected in this study could add considerable information to the data base.

Identifications of White River collections were carried out during the four-year period of the study. During this time, degree of taxonomic accuracy achieved increased as familiarity with specimens improved and as new information became available. Much of this new information resulted from confirmation work performed on the more difficult taxa by Dr. Richard Baumann of Brigham Young University, Provo, Utah. All specimens were maintained, and identifications were checked and updated at the conclusion of the study. These specimens are retained in a reference collection and are available at EMSL-LV for inspection. They should be useful for comparisons with White River invertebrates collected in the future, for study of life histories through analysis of size distributions, and for updating identifications in reference to future taxonomic research and publications.

Format for presenting identifications in this report follows that recommended by Knutson et al. (1980) (Appendix A). Nomenclature presented without any qualifier represents identifications which fit published descriptions with certainty or which were confirmed by a taxonomic specialist. The qualifiers "probable" and "possible" indicate degree of uncertainty associated with other identifications.

Sample standard deviations were calculated for all individual taxa and for groups of related taxa that had a total collection count of 50 or greater (Appendix B). Standard deviations are provided to give relative indications of the between-replicate variability and to assist in interpreting data. The percentage breakdown of each sample set into the major taxa was calculated to facilitate comparisons between collections in terms of overall invertebrate composition. Percentage breakdown was also calculated within those insect orders that were identified to lower taxonomic levels and were abundant (at least 200 total count) in the sample set. These latter percentages were provided to allow direct comparisons of faunal composition for specific benthos components.

RESULTS

Appendix A lists the 136 identified taxa and presents a semi-quantitative summary of the information obtained for each taxon in terms of abundance by season and river section. Appendix A also provides a key to identification codes used in Appendix B. Appendix B presents data from each of the 74 collections in greater detail.

The distribution summary (Appendix A) treats White River macrobenthic data by river section. The downstream section includes Sites 20 through 60 in the vicinity of the U-a/U-b Oil Shale Tracts; the middle section extends from Site 90 near Rangely, Colorado to Site 170 near Meeker; the upstream section includes Sites 180 through 350 upstream from Meeker (Figure 1 and Table 1). Data were grouped in this manner for presentation purposes, although few if any abrupt biotic changes between reaches were apparent. Typically, differences that exist are in terms of relative abundance rather than of presence or absence. Important sources of natural variation that should be considered for the design of biomonitoring surveys are discussed below.

ANNUAL VARIATION

Figure 2 shows the relative abundance of five common mayfly species collected from sites 130 and 140 during the period mid-September to early October 1976 through 1979. The five species represent at least 95 percent of all mayflies included in each collection. Mayflies were chosen for this and other examples as they are generally the most diverse and abundant insects in the study area. Site 130 is immediately downstream, and site 140 immediately upstream, from the confluence of Piceance Creek. While there is considerable variation in relative abundance of the five species from year to year, there is much less variation between collections from each of the two sites for any given year. Presumably, whatever factors are responsible for the annual variation in mayfly composition affect each site similarly. Differences between sites also tend to remain consistent from year to year. For example, *Ephemerella inermis* is consistently more abundant and *Pseudocloeon* sp. is consistently less abundant at site 140 than at site 130. There are some exceptions to this pattern (e.g., *Rhithrogena* sp., 1977), but these are minor in comparison to the degree of annual variation found in the biota at a given site.

Such patterns indicate that the investigator should utilize between-site comparisons, thus relying on the relatively stable similarity in species composition normally found between paired sites. This approach (discussed in a later section) will minimize the tendency of large annual variations to disguise water quality impacts.

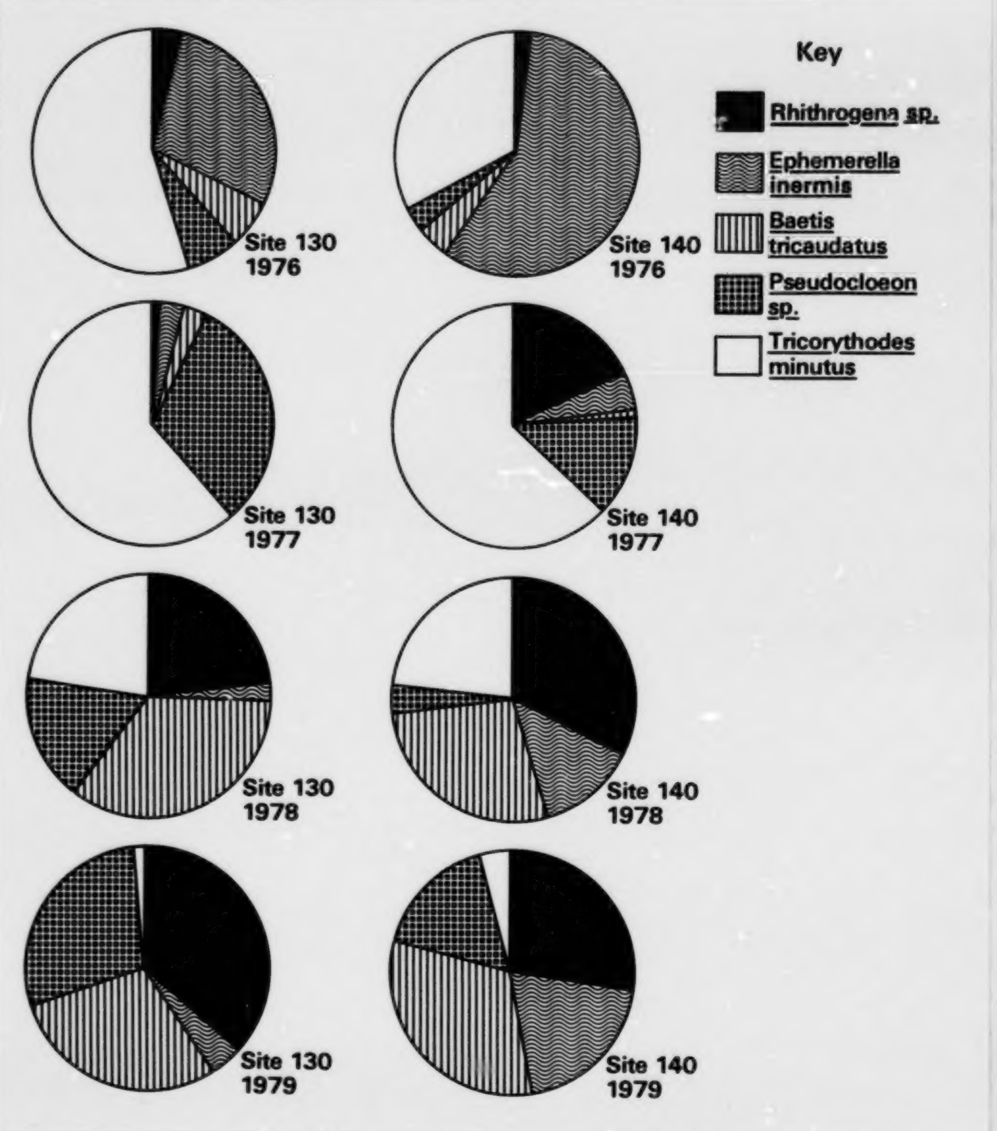

Figure 2. Relative abundances (percentages) of common mayfly species collected from Sites 130 and 140 during the fall of each year from 1976 through 1979.

SEASONAL CHANGES

A very noticeable feature of stream invertebrate communities is the natural progression of different taxa that occurs throughout the year (Hynes 1970). For this reason, collections taken during the same season are best suited for comparative studies. Typical seasonal variation is illustrated in Figure 3, with 1978 data from site 114 immediately downstream from Yellow Creek. Common mayfly species and major groups of insects are presented. Seasonal changes in mayfly composition are very evident, including low spring mayfly diversity, summer dominance of *Baetis* sp. (#1210) and concurrent disappearance of *Ephemerella inermis* (#310), and high fall densities of *Rhithrogena* sp. (#20). These patterns are consistent with data presented by Ames (1977). Seasonal changes among major groups were also evident. Most notable were the increase of caddisfly numbers during summer and fall (also observed by Ames 1977) and the extreme summer peak of black flies[1] (not observed by Ames 1977).

Taxonomic features used for species identification of a few genera are only apparent during seasons when late instars are collected. This occasionally results in apparent seasonal differences in species data. For example, early instars of Isoperla stoneflies are listed as *Isoperla* spp. in fall data, while the late instar specimens collected during spring are identified as *I. mormona* and *I. quinquepunctata* (Appendices A and B).

SHORT-TERM TEMPORAL VARIATION

Collections taken from sites 30 and 60 during September 1976 and sites 130, 140, and 230 during April and May 1978 give an indication of variation anticipated over short periods (2 1/2 and 6 weeks) within any season. Some faunal changes observed are presented graphically in Figure 4 for sites 30 and 130. Although noticeable changes are exhibited in counts of both mayfly species and major insect groups, relative abundances of each remain fairly consistent between sampling dates (Figure 4). Variations in composition are relatively small in comparison to observed seasonal variations (Figure 4). Nevertheless, life history factors can produce substantial short-term changes which should not be discounted. For example, the fact that *Traverella albertana* (#810) emerges during late August and September (Edmunds et al. 1976) is reflected in a decrease at site 30 between September 5 and September 23. Naturally occurring short-term environmental events such as storms and floods may also produce significant effects on macroinvertebrate communities (Hynes 1970). Additionally, the large reduction in numbers of all taxa collected at site 130 between April and May 1978, illustrates how sampling problems may impact the total count data on a short-term basis. During early April, water depth was sufficiently shallow to allow easy sample collection, while by the middle of May, mountain snowmelt had swollen the river to a point where the increased depth and velocity made reliable sampling very difficult. The relative abundance, however, among the mayfly species and among the major invertebrate groups remained largely unaltered (Figure 4).

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[1] Black fly populations were extremely patchy both seasonally and spatially at all stations throughout the study.

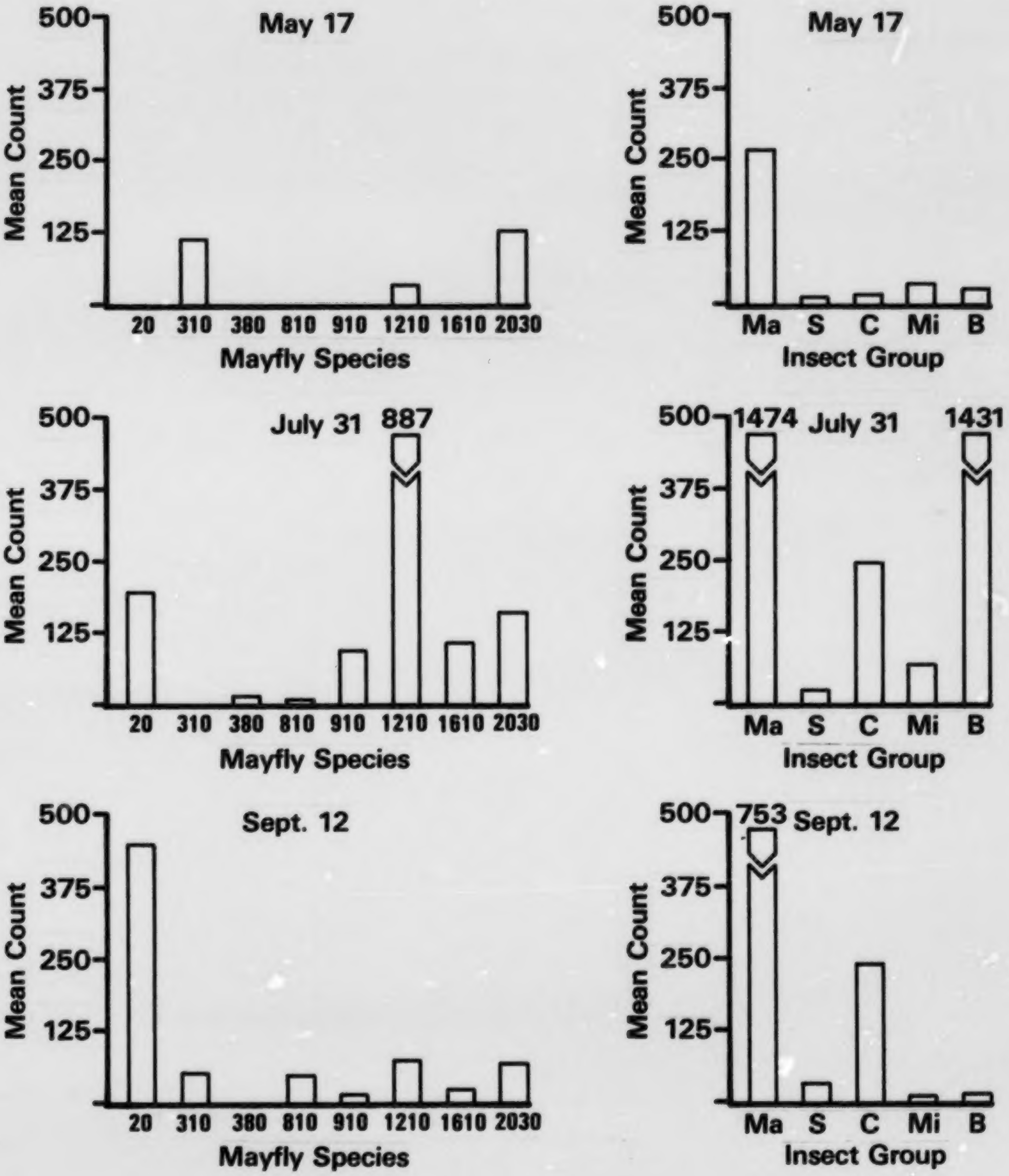

Figure 3. Seasonal variation exhibited by individual mayfly species and by major insect groups in 1978 collections from Site 114. (See Appendix A for species codes used for mayfly species. For major groups, Ma = mayflies, S = stoneflies, C = caddisflies, Mi = midges, and B = black flies.)

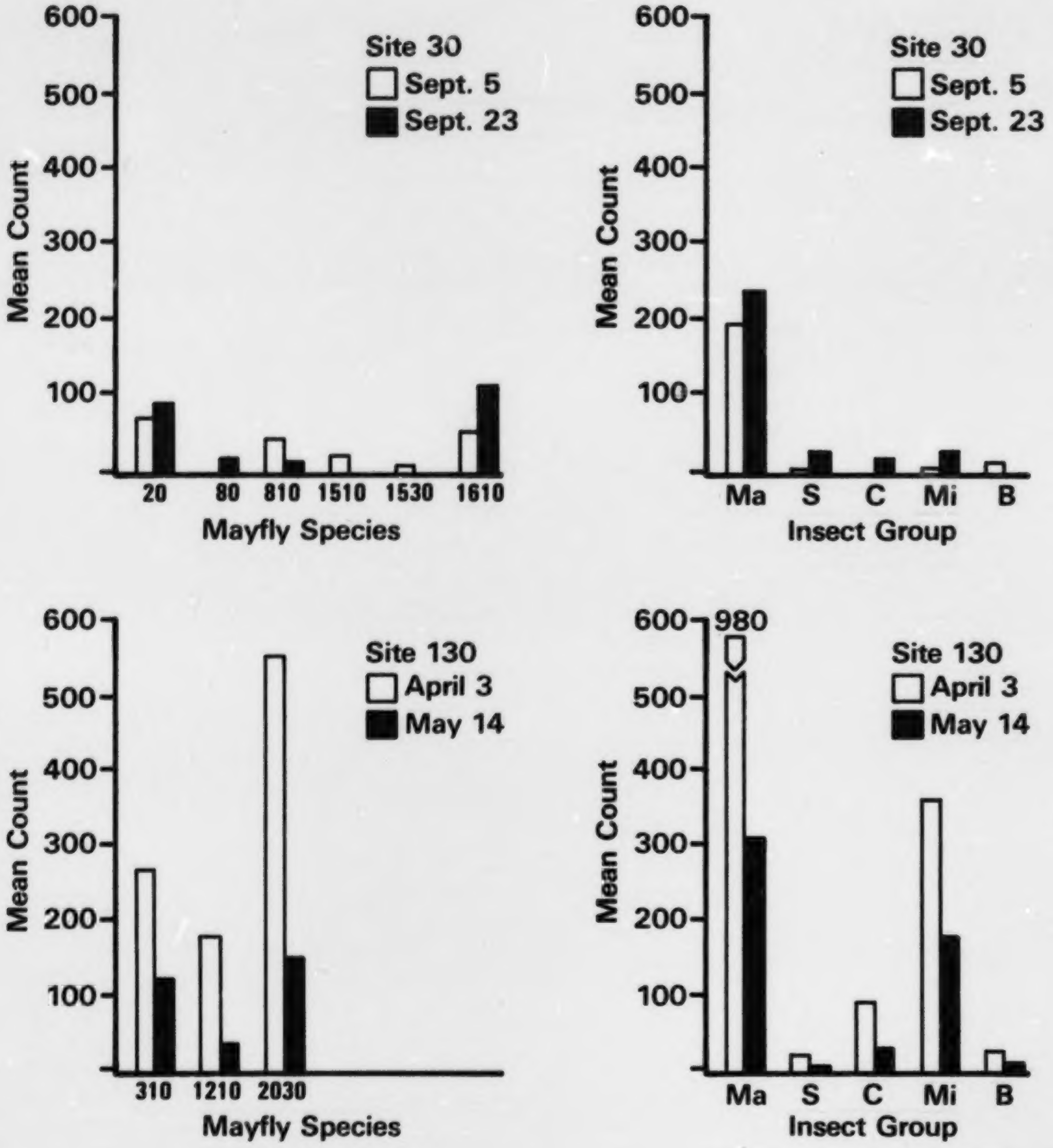

Figure 4. Short-term variation exhibited by individual mayfly species and by major insect groups in 1978 collections from Site 30 and Site 130. (See Appendix A for species codes used for mayfly species. For major groups, Ma = mayflies, S = stonflies, C = caddisflies, Mi = midges, and B = black flies.)

Such short-term changes must be taken into account whether they result from actual alterations in the stream biota or from variations in sampling conditions. In particular, an upstream (reference) site should be sampled concurrently with the downstream site with which it is paired if between-site natural variability is to be minimized.

FAUNAL CHANGES ALONG RIVER

Most taxa are found for considerable distances along the river. A few taxa are abundant throughout most of the study area, e.g., *Baetis tricaudatus*, *Ephemerella inermis*, and *Rhithrogena* sp. Figures 5 and 6 illustrate typical patterns of longitudinal change in the relative abundance of macrobenthic species. *Traverella albertana* and *Dactylobaetis cepheus* (Figure 5) are abundant only in the downstream half of the river, while the distribution of *Pseudocloeon* sp. extends somewhat further upstream (upper graph). Taxa collected from upstream sites include *Pteronarcella badia*, *Brachycentrus* sp., and *Lepidostoma* sp. (lower graph).

Taxa presented in the upper graph of Figure 6 are members of a single caddisfly family (Glossosomatidae). Moving from downstream to upstream, *Culoptila* sp. is supplanted by *Protoptila* sp. and *Glossosoma* sp. All three species occur together at the limit of the distribution of each around site 120. With the riffle beetle family, Elmidae (lower graph), *Microcylloepus pusillus* predominates at downstream sites, *Zaitzevia parvula* and *Optioservus quadrimaculatus* predominate at upstream sites, and all species occur sympatrically in the transition zone along the middle reaches.

INCORPORATION OF MACROINVERTEBRATE DATA INTO AN INTEGRATED MONITORING PROGRAM

In the absence of man-induced disturbances or natural phenomena that substantially alter stream characteristics, changes in macroinvertebrate community composition in a downstream progression are normally gradual. Consequently, abrupt differences in the biota between adjacent upstream/downstream sites may be an indication that significant water quality changes have occurred, thereby signaling the need to incorporate additional elements into the monitoring program. The degree of differences between communities will determine the associated level of monitoring required to identify and quantify causative agents (Table 2). If differences between upstream/downstream communities fall with the range of natural variability as established by baseline sampling, the communities are judged to be non-impacted and level 1 monitoring is continued. Should level 1 monitoring reveal between-site differences that exceed natural variability, a water quality impact is suspected and level 2 monitoring is initiated to identify causative agents. In the event level 1 monitoring reveals complete or nearly complete downstream alterations in the biota, level 3 monitoring is implemented.

Criteria for the degree of community change needed to trigger a monitoring decision are derived by close inspection of predevelopment baseline data, including variations in these data. This approach is illustrated with the mayfly composition of collections taken immediately upstream (site 140) and

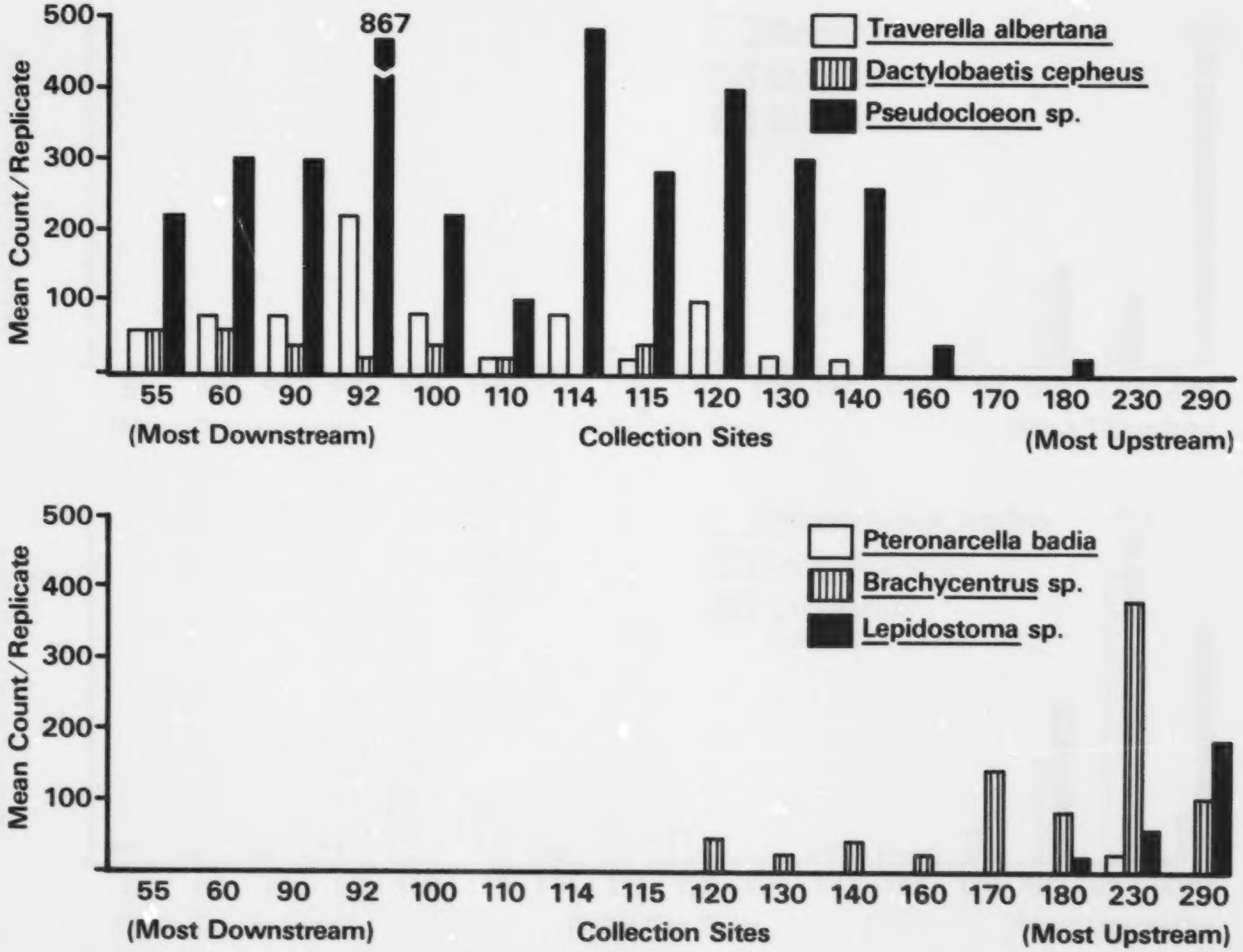

Figure 5. Variation along river in mean count per replicate for selected mayflies, stoneflies, and caddisflies (September 1979 collections).

TABLE 2. SUGGESTIONS FOR USING COMMUNITY CHANGE TO ESTABLISH MONITORING REQUIREMENTS

Level	Degree of Community Change	Degree of Monitoring
1	Within natural variation	Continue macroinvertebrate community monitoring schedule
2	Exceeds natural variation	Conduct water column monitoring for coventional parameters (e.g., conductivity, dissolved oxygen, temperature, pH. Conduct sediment and/or tissue analyses for suspected pollutants (e.g., priority pollutant scan).
3	Complete or nearly complete changes	Level 2 plus water column analyses for suspected pollutants and bioassays with source toxicant if available (e.g., effluent, tributary water, leachate, etc.)

downstream (site 130) from the confluence of Piceance Creek during the fall, 1976-1979 (Figure 2, Appendix B, Tables 37, 38, 42, 45, 47, 52, and 55). Many alterations other than the few examples discussed below could be significant indicators of change for the aquatic biologist familiar with variation normal for the area.

> Rhithrogena sp.: The most dramatic decrease in relative abundance from the upstream reference site (140) to the downstream site (130) occurred during 1977, when this species decreased from 17% to only 1% of mayflies collected (Figure 2). A decrease of this magnitude (common to uncommon) falls within the natural variation of pre-development data, and a much more dramatic downstream decrease, such as from dominant (>50%) to uncommon (<5%) or an increase of comparable magnitude would be necessary to justify incorporating additional monitoring elements.
>
> Ephemerella inermis: This species has often exhibited a pre-development downstream decrease in relative abundance either from dominant to common (1976) or from common to uncommon (1977, 1978, and 1979; Figure 2). Therefore, as with Rhithrogena, a downstream decrease from dominant to uncommon, or a substantial increase, would be needed to alert the biologist to a possible toxic discharge to the intermediate stream reach and initiation of chemical monitoring.

Baetis tricaudatus: During all four baseline years, the relative importance of Baetis tricaudatus remained similar between the reference site and the downstream site (Figure 2). With this species then, a substantial downstream increase or decrease (i.e., >10%) in its relative abundance would be suspect as possibly resulting from other than natural impacts.

Pseudocloeon sp.: In all four baseline years, this species exhibited substantial downstream increases in relative mayfly abundance (Figure 2). These data indicate that any downstream decline in its relative importance would be unexpected, alerting the biologist to a possible recent impact on the intermediate stream reach.

Tricorythodes minutus: This mayfly, like Baetis, exhibited relatively small between-station variability, although yearly differences were pronounced at both sites (Figure 2). The greatest upstream-downstream differences occurred during 1976 when Tricorythodes minutus contributed 55 percent of the mayflies at the upstream site and 32 percent at the downstream site (dominant to common). Provided this pre-development pattern continues, a substantial decrease (e.g., dominant to uncommon) or an increase of any magnitude in the percentage composition of Tricorythodes at the downstream site relative to the reference site would indicate possible impact to the intermediate stream reach.

Unexpected changes among higher taxonomic categories will alert the aquatic biologist to recent toxic discharges of greater severity than those affecting individual species. For example, mayflies constituted at least 40% of all invertebrates collected from each of sites 130 and 140 in each of the 1976-1979 fall collections (Appendix B). If, subsequent to industrialization, mayflies as a group decrease dramatically downstream, while remaining abundant at the reference site, this change would greatly exceed natural variation and level 2 monitoring would be recommended. If mayflies decreased to very rare (<5% of all invertebrates) downstream, this complete change of biota caused by a very severe impact would necessitate inclusion of level 3 monitoring. Similarly, a very severe impact would be suspected from a drastic reduction of all invertebrates collected at the downstream site. In such cases of extreme biotic changes, the biologist will easily be able to further pinpoint the location of recent toxic discharge(s) by collecting in a downstream direction from the reference site until the changes are first noted.

Because the purpose of the biomonitoring approach outlined is to detect unsuspected sources of complex toxic pollutants, it is important that information on faunal changes be site specific. Thus, no attempt has been made to reduce data into generalized indices, such as diversity measures, or through use of clustering techniques. The additional effort required to carefully identify and compare more common species and groups from adjacent stream sites is minimal in relation to thtotal expenditure needed for proper stream monitoring. As the aquatic biologist becomes familiar with stream conditions, biology and ecology of resident invertebrates, he will also become more efficient and accurate at making appropriate comparisons.

Literature information is available on sensitivies of some aquatic invertebrates, including species of immature insects, to various toxic metals and certain organic compounds (e.g., chlorinated hydrocarbon pesticides). Disappearances or reduction in density of known sensitive species from a particular site would provide an immediate clue that toxic chemicals may be entering the system. This assumes, of course, that upstream sites are not similarly affected and other causes of the disturbance (e.g., ecological habitat alterations) cannot be identified.

Chemical analysis of sediments and stationary invertebrates may detect complex toxicants that are below detectable levels in the water, or which are caused by intermittent discharges and would consequently be missed by water-column sampling. This type of analysis and measurement of conventional water quality parameters (level 2) would be implemented after a possible toxic discharge is detected by the analysis of invertebrate collections (level 1 monitoring). In lieu of considerable baseline data on tissue contents of biocumulative substances, sampling sites in the nonimpact area (upstream site), but with communities similar to these of the impact area, would serve as controls.

Although considerable information is available on the organic and elemental components of energy related wastes and effluents (Pellizzari 1978), information on the toxicity of complex organic compounds associated with these wastes, to freshwater aquatic invertebrates is limited. Information on the toxicity of complex mixtures of wastes and effluents to resident stream organisms could be obtained from toxicity tests conducted in the field and laboratory. Such tests would involve exposing resident organisms to various concentration of wastes to determine sensitivities of various taxa to specific pollutants or pollutant mixtures. Information derived in this manner would aid considerably in relating changes in community composition to toxic wastes for purposes of interpreting biomonitoring data.

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APPENDIX A

KEY TO SPECIES IDENTIFICATION CODES AND SUMMARY OF DISTRIBUTION INFORMATION.

SECTION OF STREAM[1]:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE[2]	ABUNDANCE CODE[3]						
INSECTA								
Ephemeroptera (Mayflies)								
Heptageniidae								
Rhithrogena sp.	20	COM	COM	ABU	ABU	RAR	UNC	COM
Heptagenia simpliciodes	30			UNC	RAR			
Heptagenia solitaria	80	COM	UNC	COM	COM			RAR
Cinygmula sp.	120							RAR
Epeorus sp.	230					UNC	UNC	RAR
Ephemerellidae								
Ephemerella inermis	310	UNC	ABU	UNC	ABU	ABU	UNC	ABU
Drunella grandis	320		RAR	RAR	RAR	UNC	UNC	COM
Drunella doddsi	330							UNC
Serratella micheneri	380			ABU	RAR			
Attenella margarita	390			RAR			UNC	
Siphlonuridae								
genus unidentified	500		RAR					RAR
Isonychia sicca campestris	510			RAR				
poss. *Siphlonurus*	650	RAR	RAR					

(continued)

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[1] The lower reaches consist of Sites 20-60; middle reaches are sites 90-170; upper reaches are Sites 180-350.

[2] This code is used in Appendix B.

[3] Abundance codes:
ABU = abundant (Mean of per replicate mean counts for all sample sets of same season and stream section is 50 or more.)
COM = common (Mean of per replicate mean counts is 10-49.)
UNC = uncommon (Mean of per replicate mean counts is 2-9.)
RAR = rare (Mean of per replicate mean counts does not exceed one.)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Leptophlebiidae								
Traverella albertana	810	ABU		COM	COM			
Choroterpes albiannulata	910	RAR		COM	UNC			
Paraleptophlebia sp.	1010		RAR	RAR		RAR	RAR	
Paraleptophlebia sp. prob. *memorialis*	1030	RAR			UNC	UNC		COM
Paraleptophlebia sp. prob. *debilis*	1050			RAR	RAR			
Baetidae								
Baetis sp. prob. *tricaudatus*	1210	RAR	ABU	ABU	ABU	ABU	ABU	ABU
Baetis sp. poss. *parvus*	1220	RAR		RAR	RAR	UNC		RAR
Dactylobaetis sp. 1	1510	COM		COM	COM			
Dactylobaetis sp. 2	1530	UNC		RAR				
Pseudocloeon sp.	1610	ABU	RAR	ABU	ABU	RAR	COM	UNC
Pseudocloeon prob. sp. 2	1620			RAR				
poss. *Callibaetis*	1710		RAR					
poss. *Paracloeodes*	1860	RAR		RAR				
Tricorythidae								
Tricorythodes minutus	2030	UNC	ABU	ABU	ABU	RAR		UNC
Tricorythodes edmundsi	2040	RAR						
Oligoneuriidae								
Lachlania saskatchewanensis	2310	RAR		RAR				
Polymitarcyidae								
Ephoron album	2510			RAR	RAR			
Caenidae								
Caenis sp.	2710		RAR					
Plecoptera (Stoneflies)								
Perlidae								
Acroneuria abnormis	3510	RAR						
Hesperoperla pacifica	3530					RAR	RAR	RAR
Claassenia sabulosa	3610		UNC	UNC	UNC	RAR		UNC

(continued)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Perlodidae								
Isogenoides sp.	3710	UNC	UNC	UNC	COM	UNC	COM	COM
Diura knowltoni	3800		RAR					
Isoperla spp.	3810	RAR	UNC	RAR	COM	UNC		UNC
Isoperla quinquepunctata	3820		COM	RAR		UNC		
Isoperla sp. poss. *fulva*	3850					RAR		
Isoperla mormona	3880		COM	RAR	RAR			
Chloroperlidae								
genus unidentified	4000		RAR		RAR	COM	RAR	COM
Nemouridae								
genus unidentified	4090					RAR		RAR
poss. *Zapada*	4140				RAR			
poss. *Amphinemura*	4190						RAR	
Taeniopterygidae								
Oemopteryx fosketti	4210	RAR			RAR			
Capniidae								
genus unidentified	4330			RAR	UNC			
Pteronarcidae								
Pteronarcella badia	4510			RAR	RAR	UNC	UNC	COM
Pteronarcys californica	4560		RAR		RAR	RAR	RAR	RAR
Odonata (Dragonflies and Damselflies)								
Gomphidae								
Ophiogomphus severus	4710	UNC	RAR	RAR	RAR			
Coenagrionidae								
Hetaerina americana	5120	RAR						
Argia sp.	5310	RAR	RAR		RAR			
Ischnura sp.	5500				RAR			
Lestidae								
Lestes sp.	5601		RAR					

(continued)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Megaloptera (Dobsonflies)								
Corydalidae								
Corydalus sp.	5710	RAR						
Hemiptera (True bugs)								
Naucoridae								
Ambrysus sp.	6310	RAR			RAR			
Trichoptera (Caddisflies)								
Hydropsychidae								
Hydropsyche separata	6520	UNC		RAR	RAR			
Hydropsyche spp.	6560	COM	ABU	ABU	ABU	RAR		ABU
Cheumatopsyche spp.	6630	RAR	COM	UNC	ABU	RAR		RAR
genus unidentified	7100	RAR			RAR			
Smicridea sp.	6650	RAR						
Arctopsyche grandis	6710				RAR	RAR	UNC	UNC
Leptoceridae								
Nectopsyche sp.	7120	RAR						
Oecetis avara	7130	RAR	RAR		RAR			RAR
Triaenodes sp.	7150				RAR			
Ceraclea sp.	7180							RAR
Brachycentridae								
Brachycentrus sp.	7410	RAR	RAR	COM	COM	COM	ABU	ABU
Hydroptilidae								
Hydroptila sp.	7710	RAR	RAR	RAR	COM	COM		UNC
Ochrotrichia sp.	7730	RAR		UNC	UNC			UNC
Mayatrichia ayama	7850			COM	RAR			
Neotrichia sp.	7860	RAR		RAR	RAR			
Psychomyiidae								
Psychomyia flavida	8310		RAR		UNC	UNC		UNC
Tinodes sp.	8360				RAR			
Rhyacophilidae								
Rhyacophila spp.	8630							UNC

(continued)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Lepidostomatidae								
Lepidostoma sp.	8910		RAR	RAR	RAR	COM	ABU	ABU
Lepidostoma poss. sp. 2	8920			RAR				
Glossosomatidae								
Culoptila sp.	9020	RAR	RAR	RAR	RAR			
prob. *Protoptila*	9030				RAR	RAR	RAR	RAR
Agapetus sp.	9060							RAR
Glossosoma sp.	9110				RAR	RAR		ABU
Limnephilidae								
genus unidentified	9510							RAR
Oligophlebodes sp.	9530							UNC
Hesperophylax sp.	9560					UNC		RAR
Diptera (True flies)								
Chironomidae (Midges)	10510							
all		COM	ABU	ABU	ABU	ABU	ABU	ABU
Simuliidae (Black flies)	17510							
all		COM	COM	ABU	ABU	COM	ABU	ABU
Ceratopogonidae								
genus unidentified	18010	RAR	UNC	RAR	RAR	UNC		RAR
Dasyhelea sp.	18020		RAR					
Dolichopodidae								
genus unidentified	18180		RAR		RAR	UNC		RAR
Empididae								
genus unidentified	18210	RAR	RAR	RAR		RAR		RAR
poss. *Chelifera*	18240		RAR	RAR	RAR	UNC	RAR	UNC
Tipulidae								
Hexatoma sp	18360	RAR	RAR	RAR		UNC	UNC	UNC
Tipula sp.	18410					RAR		
Antocha sp.	18450				RAR	RAR		UNC
Rhagionidae								
Atherix variegata	18710	RAR	UNC	UNC		RAR	UNC	COM

(continued)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Blephariceridae								
Agathon sp.	18720						UNC	UNC
Bibliocephala sp.	18740						UNC	UNC
Deuterophlebiidae								
Deuterophlebia sp.	18780						UNC	RAR
Stratiomyidae								
Nemotelus sp.	18810	RAR	RAR					
Euparyphus sp.	18820				RAR			
Tabanidae								
Tabanus sp.	19010	RAR			RAR			
Psychodidae								
Pericoma sp.	19220					RAR		RAR
Ephydridae								
genus unidentified	19300		RAR					
Muscidae								
Limnophora sp.	19370		RAR					RAR
Family unidentified	19490		RAR					
Lepidoptera (Moths)								
Pyralidae								
Parargyractis sp.	19510	RAR	RAR	RAR	RAR			
Coleoptera (Beetles)								
Elmidae								
Microcylloepus pusillus	19720	UNC	PAR	COM	UNC			RAR
Zaitzevia parvula	19770	RAR	RAR	UNC	UNC	COM	COM	ABU
Heterlimnius sp. poss. *corpulentus*	19870							RAR
Optioservus quadrimaculatus	19930		RAR	RAR	UNC	ABU	ABU	ABU
prob. *Stenelmis*	19960	RAR	RAR		RAR			
Narpus concolor	20010							RAR
Dubiraphia quilianii	20060		RAR		RAR			

(continued)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Dryopidae								
Helichus sp.	20310	RAR			RAR		RAR	
Dytiscidae								
prob. *Oreodytes*	20410	RAR			RAR			RAR
poss. *Deronectes*	20440							RAR
Colymbetes sp.	20450			RAR				
Haliplidae								
Haliplus sp.	20610		RAR					
Hydrophilidae								
poss. *Helophorus*	20820		RAR					
Hydraenidae								
genus unidentified	20900	RAR				RAR		
poss. *Ochthebius*	20920		RAR					
ACARI								
Hydracarina (Water mites)								
Lebertiidae								
Lebertia sp.	21410	RAR	RAR	RAR	RAR	RAR		UNC
Torrenticolidae								
Torrenticola sp.	21470				RAR			RAR
prob. *Testudacarus*	21480							RAR
Sperchonidae								
Sperchon sp.	21510	RAR	UNC	UNC	RAR	RAR	UNC	COM
Sperchonopsis sp.	21550							RAR
Protziidae								
Protzia sp.	21640							RAR
Hygrobatidae								
Atractides sp.	21700		RAR	RAR	RAR			RAR
poss. *Corticacarus*	21720				RAR			UNC
Limnocharidae								
poss. *Limnochares*	21810				RAR			

(continued)

APPENDIX A (Continued)

SECTION OF STREAM:		Lower Reaches	Middle Reaches			Upper Reaches		
SEASON:		Fall	Spr	Sum	Fall	Spr	Sum	Fall
NUMBER OF SAMPLE SETS TAKEN:		14	13	10	22	2	1	12
TAXONOMIC CATEGORY	SPECIES CODE	ABUNDANCE CODE						
Oribatei								
poss. *Trhypochthonius*	21980				RAR			
CRUSTACEA								
Amphipoda (Water fleas)								
Talitridae								
Hyalella azteca	41060		RAR			RAR		RAR
OLIGOCHAETA (Worms)								
unidentified	59010	UNC	COM	COM	ABU	ABU	UNC	COM
GASTROPODA								
Family unidentified	63400					RAR		
Lymnaeidae								
Lymnaea sp.	63410					RAR		RAR
Planorbidae								
Helisoma/Gyraulus complex	63810							RAR
Physidae								
Physa sp.	64310				RAR	COM		UNC
PELECYPODA								
Family unidentified	65010							RAR

APPENDIX B

TABLE B-1. SITE 20, SEPTEMBER 10, 1976 (15 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	267	(131)	54	% of Ephemeroptera
20	20	(19)		8
80	22	(11)		8
310	1			*
810	58	(39)		22
910	*			*
1210	2			1
1220	*			*
1510	19	(8)		7
1530	1			*
1610	126	(60)		47
1860	2			1
2030	14	(7)		5
2040	1			*
Plecoptera	11	(6)	2	
3510	1			
3710	9	(5)		
3810	*			
Odonata (4710)	4	(2)	1	
Megaloptera (5710)	*		*	
Trichoptera	35	(18)	7	% of Trichoptera
6520	5	(-)[2]		15
6560	28	(-)[2]		80
6630	*			*
6650	*			1
7130	*			*
7410	*			1
7710	*			*
7730	*			1
7860	*			*
9020	1			2
Chironomidae (all)(10510)	147	(75)	30	
Simuliidae (all)(17510)	27	(23)	5	

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[1] Each replicate was completely processed.

[2] S.D.'s not available due to processing error.

*Values less than 1.

(continued)

TABLE B-1. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Minor Diptera	3		1	
18010	*			
18210	*			
18360	2			
18710	1			
Coleoptera	1		*	
19720	1			
19760	*			
19960	*			
Oligochaeta (all) (59010)	1		*	
Total organisms	496	(233)		

* Values less than 1.

TABLE B-2. SITE 30, September 5, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	201	(61)	85	% of Ephemeroptera
20	75	(23)		37
80	1			*
310	1			*
810	42	(14)		21
1210	1			*
1220	*			*
1510	20	(15)		10
1530	12	(8)		6
1610	48	(23)		24
1860	*			*
2030	2			1
2310	*			*
Plecoptera	8	(4)	3	
3510	*			
3710	7	(4)		
Odonata (4710)	*		*	
Trichoptera	2		1	
6520	*			
6560	2			
Chironomidae (all) (10510)	8	(4)	3	
Simuliidae (all) (17510)	15	(8)	6	
Minor Diptera	2		1	
18360	1			
18710	1			
Coleoptera	*		*	
19720	*			
19960	*			
20900	*			
Total organisms	236	(69)		

[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-3. SITE 30, SEPTEMBER 23, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	244	(96)	74	% of Ephemeroptera
20	88	(97)		36
80	10	(10)		4
310	3			1
810	15	(11)		6
910	*			*
1210	1			*
1220	*			*
1510	5			2
1530	*			*
1610	116	(61)		47
1860	*			*
2030	6	(5)		2
Plecoptera (3710)	24	(7)	7	
Odonata (4710)	3		1	
Trichoptera	21	(17)	6	% of Trichoptera
6520	2			10
6560	18	(14)		85
7410	*			1
9020	1			3
Chironomidae (all) (10510)	31	(12)	9	
Simuliidae (all) (17510)	2		1	
Minor Diptera	7	(4)	2	
18210	1			
18360	6	(4)		
18710	*			
Coleoptera (19720)	1		*	
Oligochaeta (all)	*		*	
Total organisms	332	(116)		

[1] Each replicate was completely processed.
*Values less than 1.

TABLE B-4. SITE 30, October 2, 1977 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	726	(379)	73	% of Ephemeroptera
20	1			*
80	24	(14)		3
310	*			*
650	*			*
810	155	(64)		21
910	*			*
1210	1			*
1510	40	(24)		5
1530	2			*
1610	481	(336)		66
2030	21	(12)		3
2040	*			*
2310	1			*
Plecoptera	3		*	
3710	*			
4210	3			
Hemiptera (6310)	*		*	
Trichoptera	4		*	
6520	*			
6560	3			
6630	*			
7710	*			
9020	*			
Chironomidae (all)(10510)	14	(8)	1	
Simuliidae (all)(17510)	235	(120)	24	
Minor Diptera	3		*	
18010	*			
18210	2			

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[1] Each replicate was completely processed.
*Values less than 1.

(continued)

TABLE B-4. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	4		*	
19720	3			
19960	*			
Hydracarina (21510)	*		*	
Oligochaeta (all) (59010)	*		*	
Total organisms	988	(377)		

*Values less than 1.

TABLE B-5. SITE 40, September 8, 1976 (15 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	305	(129)	50	% of Ephemeroptera
20	20	(13)		7
80	15	(6)		5
310	5	(3)		2
810	158	(90)		52
910	8	(6)		3
1210	1			*
1220	*			*
1510	30	(14)		10
1530	1			*
1610	53	(26)		17
1860	1			*
2030	14	(7)		4
2310	*			*
Plecoptera (3710)	1		*	
Odonata (4710)	9	(6)	1	
Trichoptera	77	(42)	13	% of Trichoptera
6520	11	(-)[2]		14
6560	64	(-)[2]		83
6630	*			*
7410	*			1
7710	1			1
7730	*			*
9020	1			1
Chironomidae (all)(10510)	193	(77)	32	
Simuliidae (all)(17510)	15	(11)	2	
Minor Diptera	2		*	
18210	1			
18360	1			
18710	1			
Lepidoptera (19510)	*		*	

---

[1] Each replicate was completely processed.

[2] S.D. not available due to processing error.

*Values less than 1.

(continued)

TABLE B-5. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	3		1	
19720	3			
19960	*			
Hydracarina (21510)	*		*	
Oligochaeta (all) (59010)	6	(3)	1	
Total organisms	613	(221)		

*Values less than 1.

TABLE B-6. SITE 48, SEPTEMBER 28, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	89	(57)	46	% of Ephemeroptera
20	24	(22)		27
80	21	(21)		24
310	6	(4)		7
810	14	(17)		16
1210	1			1
1510	*			*
1530	*			*
1610	20	(6)		22
2030	3			3
Plecoptera (3710)	9	(7)	5	
Odonata	6	(3)	3	
4710	5	(3)		
5310	*			
Trichoptera	73	(70)	38	% of Trichoptera
6520	2			2
6560	71	(69)		97
6630	*			*
7410	1			1
Chironomidae (all)(10510)	10	(5)	5	
Simuliidae (all)(17510)	1		*	
Minor Diptera	2		1	
18210	1			
18360	*			
18710	1			
18810	*			
19010	*			
Coleoptera	3		2	
19720	*			
20310	3			
20410	*			
Oligochaeta (all)(59010)	1		*	
Total organisms	193	(118)		

[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-7. SITE 50, SEPTEMBER 9, 1976 (15 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	174	(42)	51	% of Ephemeroptera
20	30	(15)		17
80	15	(4)		9
310	8	(3)		5
810	49	(19)		28
910	3	(2)		2
1210	*			*
1220	*			*
1510	29	(10)		17
1530	*			*
1610	28	(10)		16
1860	*			*
2030	10	(4)		6
Plecoptera (3710)	3		1	
Odonata (4710)	5	(2)	1	
Trichoptera	35	(13)	10	% of Trichoptera
6520	3			8
6560	28	(-)[2]		79
6630	*			*
7410	*			*
7710	*			*
7730	*			*
7860	*			*
9020	4	(3)		12
Chironomidae (all)(10510)	116	(46)	34	
Simuliidae (all)(17510)	4	(3)	1	
Minor Diptera	4	(2)	1	
18360	2			
18710	2			
Lepidoptera (19510)	*		*	

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[1] Each replicate was completely processed.

[2] S.D. not available due to processing error.

(continued)

*Values less than 1.

TABLE B-7. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	1	*	
19720	1		
19960	*		
Hydracarina (21510)	*	*	
Oligochaeta (all)(59010)	2	1	
Total organisms	342 (75)		

*Values less than 1.

TABLE B-8. SITE 52, SEPTEMBER 28, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	197	(110)	66	% of Ephemeroptera
20	25	(22)		13
80	40	(36)		20
310	12	(11)		6
810	17	(17)		9
910	1			1
1210	1			1
1510	14	(5)		7
1610	78	(45)		39
1860	*			*
2030	8	(5)		4
2310	*			*
Plecoptera (3710)	3		1	
Odonata (4710)	3		1	
Trichoptera	58	(73)	20	% of Trichoptera
6520	4			7
6560	52	(67)		90
6630	1			1
6650	*			*
7130	*			*
7410	1			1
9020	*			1
Chironomidae (all)(10510)	30	(38)	10	
Simuliidae (all)(17510)	1		*	
Minor Diptera	1		*	
18360	1			
18710	*			
Coleoptera	*		*	
19720	*			
19960	*			
Hydracarina (21510)	*		*	
Oligochaeta (all)(59010)	4		1	
Total organisms	297	(157)		

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[1] Each replicate was completely processed.
*Values less than 1.

TABLE B-9. SITE 55, SEPTEMBER 14, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	360	(124)	71	% of Ephemeroptera
20	13	(7)		4
80	5			1
810	58	(35)		16
910	*			*
1210	2			1
1510	51	(17)		14
1530	1			*
1610	226	(85)		63
2030	3			1
Plecoptera	1		*	
3510	*			
3710	1			
Odonata (4710)	2		*	
Trichoptera	83	(38)	16	% of Trichoptera
6520	10			12
6560	64	(22)		78
6630	3			4
6640	1			2
7410	2			2
7730	1			1
9020	1			1
Chironomidae (all)(10510)	46	(15)	9	
Simuliidae (all)(17510)	7		1	
Minor Diptera (18710)	2		*	
Lepidoptera (19510)	*		*	
Coleoptera	6		1	
19720	6			
19960	*			

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[1] Each of four replicates was completely processed, and one replicate was one-half processed.

*Values less than 1.

(continued)

TABLE B-9. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina (21510)	*		*	
Total organisms	507	(157)		

*Values less than 1.

TABLE B-10. SITE 60, September 4, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	123	(59)	82	% of Ephemeroptera
20	7	(4)		5
80	1			*
310	*			*
810	38	(16)		31
910	*			*
1210	*			*
1510	33	(-)[2]		27
1530	6	(-)[2]		5
1610	34	(18)		28
1860	*			*
2030	4			3
2310	1			1
Plecoptera (3710)	2		2	
Odonata (4710)	1		1	
Trichoptera	*		*	
6560	*			
7410	*			
Chironomidae (all)(10510)	*		*	
Simuliidae (all)(17510)	20	(10)	13	
Minor diptera	4		3	
18360	2			
18710	2			
Coleoptera (19960)	*		*	
Oligochaeta (all)(59010)	*		*	
Total organisms	150	(70)		

[1] Each replicate was completely processed.

[2] S.D. not available due to processing error.
*Values less than 1.

TABLE B-11. SITE 60, SEPTEMBER 26, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	142	(50)	86	% of Ephemeroptera
20	18	(11)		13
80	12	(10)		9
310	3			2
810	30	(15)		21
910	*			*
1210	1			1
1510	2			2
1530	1			*
1610	70	(29)		49
2030	4			3
2310	*			*
Plecoptera (3710)	8	(4)	5	
Odonata	3		2	
4710	2			
5120	*			
5310	*			
Trichoptera	5	(4)	3	
6520	1			
6560	3			
6630	*			
7410	*			
Chironomidae (all)(10510)	3		2	
Simuliidae (all)(17510)	*		*	
Minor Diptera	4		2	
18210	*			
18360	3			
18710	1			
Coleoptera (19770)	*		*	
Oligochaeta (all)(59010)	*		*	
Total organisms	165	(58)		

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[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-12. SITE 60, OCTOBER 1, 1977 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	298	(140)	59	% of Ephemeroptera
80	4			1
810	15	(10)		5
1210	3			1
1510	43	(30)		15
1530	3			1
1610	219	(98)		74
2030	9	(7)		3
2310	1			*
Plecoptera	*		*	
3810	*			
4210	*			
Trichoptera	5	(3)	1	
6520	*			
6560	2			
6630	*			
7710	*			
9020	3			
Chironomidae (all)(10510)	32	(18)	6	
Simuliidae (all)(17510)	151	(74)	30	
Minor Diptera	7	(3)	1	
18010	1			
18210	6	(3)		
18360	*			
18710	*			
Coleoptera	11	(5)	2	
19720	10	(5)		
19960	1			
Hydracarina (21410)	*		*	
Oligochaeta (all)(59010)	4		1	
Total organisms	508	(154)		

[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-13. SITE 60, SEPTEMBER 14, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1		4	
810	*			
2030	*			
Plecoptera (3710)	1		4	
Odonata (4710)	*		1	
Trichoptera	2		10	
6560	*			
7730	1			
9020	*			
Chironomidae (all)(10510)	5		32	
Simuliidae (all)(17510)	3		19	
Minor Diptera	1		7	
18210	*			
18360	*			
18710	1			
Coleoptera	*		2	
19720	*			
20410	*			
Hydracarina (21510)	1		5	
Oligochaeta (all)(59010)	3		17	
Total organisms	17	(5)		

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[1] Each replicate was completely processed.
*Values less than 1.

TABLE B-14. SITE 60, SEPTEMBER 14, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	531	(98)	88	% of Ephemeroptera
20	49	(62)		9
80	6			1
810	81	(30)		15
1210	1			*
1510	67	(36)		13
1530	10			2
1610	296	(58)		56
1860	1			*
2030	19	(14)		4
2310	2			*
Plecoptera (3710)	4		1	
Odonata (4710)	1		*	
Trichoptera	24	(19)	4	
6520	1			
6560	17	(16)		
7120	1			
7410	2			
9020	4			
Chironomidae (all)(10510)	19	(10)	3	
Simuliidae (all)(17510)	21	(11)	3	
Minor Diptera (18360)	3		1	
Coleoptera	4		1	
19720	3			
19960	1			
Total organisms	607	(108)		

[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-15. SITE 90, SEPTEMBER 28, 1977 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	171	(19)	81	% of Ephemeroptera
80	7			4
310	*			*
810	1			*
1210	2			1
1510	45	(18)		26
1610	103	(21)		60
2030	13	(4)		8
Plecoptera (4210)	1		*	
Trichoptera	1		1	
6630	1			
7730	*			
8360	*			
Chironomidae (all) (10510)	27	(10)	13	
Simuliidae (all) (17510)	7		3	
Minor Diptera	1		*	
18010	*			
18210	*			
Coleoptera (19720)	1		*	
Hydracarina	1		*	
21410	*			
21510	*			
Oligochaeta (all) (59010)	3		1	
Total organisms	212	(23)		

[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-16. SITE 90, April 5, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	25	(10)	42	
20	10	(3)		
80	2			
310	3			
1010	*			
1210	7			
1710	*			
2030	2			
2710	1			
Plecoptera	2		3	
3710	*			
3810	1			
Trichoptera	2		4	
6560	1			
6630	1			
Chironomidae (all)(10510)	3		6	
Simuliidae (all)(17510)	5		8	
Minor Diptera	1		1	
18010	*			
18210	*			
19300	*			
Coleoptera	1		1	
19720	*			
19960	*			
Oligochaeta (all)(59010)	21	(13)	36	
Total organisms	60	(27)		

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[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-17. SITE 90, August 1, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	807	(709)	79	% of Ephemeroptera
20	37	(29)		5
80	9			1
310	1			*
380	6			1
510	3			*
810	180	(217)		22
910	12	(8)		2
1210	109	(62)		14
1220	1			*
1510	75	(47)		9
1530	4			*
1610	57	(31)		7
2030	309	(322)		38
2310	3			*
2510	*			*
Plecoptera	29	(16)	3	
3610	1			
3710	29	(15)		
Odonata (4710)	2		*	
Trichoptera	51	(68)	5	% of Trichoptera
6520	1			2
6560	45	(60)		88
6630	1			2
7410	*			*
7710	2			3
7850	2			4
9020	*			1
Chironomidae (all)(10510)	11	(14)	1	
Simuliidae (all)(17510)	94	(88)	9	
Minor Diptera	2		*	
18010	1			
18210	1			
18710	*			

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[1] Each of three replicates was one-fourth processed, and each of two replicates was completely processed.

*Values less than 1.

(continued)

TABLE B-17. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera (19720)	16	(25)	2	
Hydracarina	2		*	
21410	1			
21510	2			
Oligochaeta (all) (59010)	9		1	
Total Organisms	1,023	(901)		

*Values less than 1.

TABLE B-18. SITE 90, SEPTEMBER 15, 1978 (15 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	12	(8)	16	
20	1			
80	1			
310	*			
810	1			
910	*			
1210	1			
1510	1			
1610	*			
2030	6	(5)		
Plecoptera	3		4	
3610	*			
3710	2			
Odonata (4710)	*		*	
Trichoptera	19	(11)	26	% of Trichoptera
6560	12	(8)		64
6630	5	(5)		24
7130	*			*
7410	*			1
9020	2			10
Chironomidae (all) (10510)	7	(7)	10	
Simuliidae (all) (17510)	6	(3)	8	
Minor Diptera	5	(2)	6	
18210	*			
18360	1			
1871	3			
Lepidoptera (19510)	*		*	
Coleoptera	3		4	
19720	2			
19770	*			
19960	*			

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-18. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	2		3	
21410	*			
21510	2			
21810	*			
Oligochaeta (all)	18	(12)	24	
Total organisms	74	(26)		

*Values less than 1.

TABLE B-19. SITE 90, SEPTEMBER 14, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	601	(191)	76	% of Ephemeroptera
20	120	(41)		20
80	12	(5)		2
310	3			*
810	86	(28)		14
1210	34	(15)		6
1510	38	(6)		6
1610	294	(126)		49
2030	14	(5)		2
Plecoptera (3710)	12	(9)	2	
Odonata (4710)	*		*	
Trichoptera	113	(78)	14	% of Trichoptera
6520	2			1
6560	80	(56)		71
6630	22	(15)		20
6640	2			1
7410	*			*
7730	*			*
7850	*			*
9020	6			5
Chironomidae (all) (10510)	4		1	
Simuliidae (all) (17510)	40	(39)	5	
Minor Diptera	15	(6)	2	
18210	1			
18360	3			
18710	11	(6)		
Coleoptera (19720)	4		1	
Hydracarina (21510)	1		*	
Oligochaeta (all) (59010)	*		*	
Total organisms	791	(252)		

[1] Each of four replicates was one-half processed, and one replicate was one-fourth processed.

*Values less than 1.

TABLE B-20. SITE 92, SEPTEMBER 14, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,640	(450)	84	% of Ephemeroptera
20	386	(125)		24
80	28	(41)		2
310	5			*
810	214	(81)		13
910	6			*
1210	100	(52)		6
1510	19	(12)		1
1610	867	(160)		53
2030	14	(6)		1
Plecoptera	29	(12)	1	
3610	2			
3710	26	(11)		
Odonata (4710)	2		*	
Trichoptera	72	(71)	4	% of Trichoptera
6560	52	(59)		72
6630	11	(16)		16
7130	2			2
7730	1			1
9020	6			9
Chironomidae (all) (10570)	6		*	
Simuliidae (all) (17510)	187	(94)	10	
Minor Diptera	10		*	
18360	5			
18710	5			
Coleoptera (19720)	7		*	
Hydracarina (21510)	2		*	
Total organisms	1,954	(592)		

[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-21. SITE 100, SEPTEMBER 15, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	591	(226)	48	% of Ephemeroptera
20	47	(8)		8
80	40	(27)		7
310	38	(31)		6
810	74	(42)		13
910	1			*
1210	98	(25)		17
1510	39	(25)		7
1610	219	(77)		37
2030	34	(25)		6
Plecoptera	11	(5)	1	
3710	5			
3810	6			
Trichoptera	264	(154)	21	% of Trichoptera
6560	188	(117)		71
6630	52	(32)		20
6640	3			1
7710	1			*
7730	20	(17)		8
Chironomidae (all)(10510)	177	(99)	14	
Simuliidae (all)(17510)	145	(83)	12	
Minor Diptera	6		1	
18010	1			
18360	4			
18710	2			
Lepidoptera (19510)	6		1	
Coleoptera (19720)	25	(23)	2	
Oligochaeta (all) (59010)	8		1	
Total organisms	1,234	(445)		

[1] Each replicate was one-fourth processed.

*Values Less than 1.

TABLE B-22. SITE 110, SEPTEMBER 17, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	388	(127)	43	% of Ephemeroptera
20	51	(16)		13
80	26	(21)		7
310	28	(19)		7
810	27	(17)		7
1210	122	(54)		32
1510	22	(14)		6
1610	101	(46)		26
2030	11	(7)		3
Plecoptera	9		1	
3710	2			
3810	7			
Trichoptera	286	(73)	31	% of Trichoptera
6560	260	(72)		91
6630	16	(15)		6
7410	2			1
7730	8			3
Chironomidae (all)(10510)	77	(28)	8	
Simuliidae (all)(17510)	118	(52)	13	
Minor Diptera	4		*	
18010	1			
18710	3			
Lepidoptera (19510)	2		*	
Coleoptera (19720)	22	(13)	2	
Hydracarina (21510)	1		*	
Oligochaeta (all)(59010)	3		*	
Total organisms	910	(141)		

[1] Each replicate was one-fourth processed.

*Values less than 1.

TABLE B-23. SITE 112, JULY 31, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	777	(184)	71	% of Ephemeroptera
20	7			1
30	7			1
80	14	(4)		2
310	*			*
380	37	(8)		5
810	16	(6)		2
910	90	(30)		12
1210	252	(59)		32
1220	*			*
1510	10	(5)		1
1610	33	(13)		4
1860	1			*
2030	307	(103)		40
2310	*			*
2510	2			*
Plecoptera	1		*	
3610	*			
3710	1			
Odonata (4710)	3		*	
Trichoptera	139	(61)	13	% of Trichoptera
6560	103	(47)		74
6630	1			1
7410	11	(11)		8
7710	1			1
7730	3			2
7850	18	(10)		13
7860	*			*
9020	*			*
Chironomidae (all)(10510)	63	(12)	6	
Simuliidae (all)(17510)	52	(27)	5	

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-23. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Minor Diptera	1		*	
18010	*			
18210	*			
18710	*			
Lepidoptera (19510)	1		*	
Coleoptera	28	(14)	3	
19720	27	(13)		
19770	1			
19930	*			
Hydracarina (21510)	1		*	
Oligochaeta (all)(59010)	28	(22)	3	
Total organisms	1,095	(272)		

*Values less than 1.

TABLE B-24. SITE 114, MAY 17, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	264	(78)	72	% of Ephemeroptera
20	1			1
80	*			*
310	108	(38)		41
1210	33	(25)		13
1610	*			*
2030	120	(45)		46
Plecoptera	10		3	
3820	6			
3880	3			
Trichoptera	13	(3)	4	
6560	8			
6630	5			
7710	*			
8310	*			
9020	*			
Chironomidae (all)(10510)	35	(31)	9	
Simuliidae (all)(17510)	24	(11)	7	
Minor Diptera	3		1	
18020	1			
18210	1			
18360	1			
18810	*			
Lepidoptera (19510)	*		*	
Coleoptera	2		1	
19720	1			
19930	1			
20060	*			
20820	*			
Oligochaeta (all)(59010)	15	(3)	4	
Total organisms	366	(95)		

[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-25. SITE 114, July 31, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,474	(224)	45	% of Ephemeroptera
20	194	(60)		13
80	7			*
380	14	(11)		1
810	10	(7)		1
910	93	(31)		6
1210	887	(171)		60
1510	1			*
1610	110	(19)		7
1710	1			*
2030	155	(57)		11
2310	1			*
2510	1			*
Plecoptera	14	(4)	*	
3610	7			
3710	5			
3810	1			
4330	1			
Trichoptera	244	(71)	7	% of Trichoptera
[illegible]560	226	(68)		93
6630	2			1
7410	2			1
7730	1			*
7850	10	(8)		4
7860	2			1
8920	1			*
Chironomidae (all)(10510)	68	(33)	2	
Simuliidae (all) (17510)	1,431	(226)	43	
Coleoptera	47	(34)	1	% of Coleoptera
19720	46	(34)		98
19770	1			2
Hydracarina (21510)	10		*	
Oligochaeta (all)(59010)	18	(5)	1	
Total organisms	3,306	(484)		

[1] Each replicate was one-fourth processed.

*Values less than 1.

TABLE B-26. SITE 114, SEPTEMBER 12, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	753	(77)	71	% of Ephemeroptera
20	443	(56)		59
80	8			1
310	52	(12)		7
810	53	(11)		7
910	16	(9)		2
1210	78	(10)		10
1610	26	(14)		3
2030	77	(17)		10
Plecoptera	32	(8)	3	
3610	3			
3710	28	(6)		
3810	1			
4330	1			
4510	*			
Odonata (4710)	1		*	
Hemiptera (5310)	*		*	
Trichoptera	243	(35)	23	% of Trichoptera
6560	180	(21)		74
6630	59	(18)		24
7410	2			1
7710	*			*
7730	1			*
Chironomidae (all)(10510)	8		1	
Simuliidae (all)(17510)	15	(8)	1	
Minor Diptera	1		*	
18210	*			
18360	1			
Lepidoptera (19510)	*		*	

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[1] Each replicate was completely processed.
*Values less than 1.

(continued)

TABLE B-26. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	2	*	
19720	*		
19770	1		
20310	*		
20410	1		
Hydracarina (21510)	1	*	
Total organisms	1,057 (53)		

*Values less than 1.

TABLE B-27. SITE 114, August 3, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,067 (468)	65	% of Ephemeroptera
20	310 (156)		29
30	1		*
80	3		*
310	2		*
380	1		*
510	1		*
810	41 (31)		4
910	11 (4)		1
1010	1		*
1210	451 (197)		42
1610	210 (100)		20
2030	36 (18)		3
Plecoptera	8	*	
2510	6		
3710	1		
4510	1		
Trichoptera	188 (88)	11	% of Trichoptera
6560	142 (65)		75
6630	1		*
7710	2		1
7730	2		1
7850	42 (24)		22
Chironomidae (all)(10510)	46 (14)	3	
Simuliidae (all)(17510)	302 (87)	18	
Minor Diptera (18360)	1	*	
Coleoptera	9	1	
19720	6		
19770	3		
Hydracarina (21510)	14 (9)	1	
Oligochaeta (all)(59010)	8	*	
Total organisms	1,642 (613)		

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[1] Each replicate was one-fourth processed.

*Values less than 1.

TABLE B-28. SITE 114, September 15, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,592	(226)	52	% of Ephemeroptera
20	700	(224)		44
80	11	(7)		1
310	66	(57)		4
810	70	(32)		4
1210	250	(62)		16
1510	1			*
1610	486	(138)		31
2030	8			1
Plecoptera	55	(9)	2	% of Plecoptera
3610	24	(5)		43
3710	26	(5)		46
3810	6			10
Odonata	2		*	
4710	2			
5310	1			
Trichoptera	1,042	(169)	34	% of Trichoptera
6560	903	(116)		87
6630	137	(65)		13
7730	2			*
7860	1			*
Chironomidae (all)(10510)	158	(161)	5	
Simuliidae (all)(17510)	209	(95)	7	
Minor Diptera (18360)	4		*	
Lepidoptera (19510)	1		*	
Coleoptera	6		*	
19720	2			
19770	5			
Hydracarina (21510)	4		*	
Oligochaeta (all)(59010)	5		*	
Total organisms	3,079	(412)		

[1] Each replicate was one-fourth processed.

*Values less than 1.

TABLE B-29. SITE 114, April 12, 1980 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	2,201 (1,269)	79	% of Ephemeroptera
20	346 (363)		16
80	1		*
310	1,003 (634)		46
1030	1		*
1210	848 (344)		39
2030	2		*
Plecoptera	182 (123)	7	% of Plecoptera
3610	3		2
3710	39 (20)		22
3800	4		2
3820	90 (73)		50
3880	45 (33)		25
Odonata (4710)	1	*	
Trichoptera	131 (104)	5	% of Trichoptera
6560	122 (95)		93
6630	10		7
Chironomidae (all)(10510)	232 (160)	8	
Simuliidae (all)(17510)	3	*	
Minor Diptera (18360)	1	*	
Hydracarina (21510)	1	*	
Oligochaeta (all)(59010)	22 (28)	1	
Total organisms	2,774 (1,360)		

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[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-30. SITE 115, May 17, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	287	(180)	56	% of Ephemeroptera
20	5			2
80	6			2
310	105	(114)		36
500	1			*
1210	38	(21)		13
1610	1			*
2030	133	(97)		46
Plecoptera	17	(12)	3	
3610	1			
3820	10			
3880	6			
Odonata (4710)	1		*	
Trichoptera	36	(29)	7	
6560	21	(15)		
6630	15	(17)		
Chironomidae (all)(10510)	35	(11)	7	
Simuliidae (all)(17510)	17	(10)	3	
Minor Diptera (18210)	2		*	
Lepidoptera (19510)	1		*	
Coleoptera (19720)	2		*	
Hydracarina (21510)	1		*	
Oligochaeta (all)(59010)	118	(64)	23	
Total organisms	516	(222)		

[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-31. SITE 115, July 31, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,016	(298)	55	% of Ephemeroptera
20	46	(65)		5
30	8			1
80	9			1
380	58	(30)		6
510	1			*
810	12			1
910	143	(65)		14
1210	275	(90)		27
1510	36	(11)		4
1530	*			*
1610	80	(19)		8
1620	1			*
2030	344	(140)		34
2510	2			*
Plecoptera	4		*	
3610	1			
3710	3			
3810	*			
Odonata (4710)	1		*	
Trichoptera	330	(134)	18	% of Trichoptera
6560	258	(107)		78
6630	6			2
7410	40	(56)		12
7710	6			2
7730	6			2
7850	12	(6)		4
7860	1			*
Chironomidae (all)(10510)	128	(39)	7	
Simuliidae (all)(17510)	260	(228)	14	

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[1] Each of four replicates was one-fourth processed, and one replicate was one-half processed.

*Values less than 1.

(continued)

TABLE B-31. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	26	(16)	1	
19720	26	(15)		
19770	1			
Hydracarina	7		*	
21410	1			
21510	4			
21700	2			
Oligochaeta (all)(59010)	69	(35)	4	
Total organisms	1,842	(557)		

*Values less than 1.

TABLE B-32. SITE 115, SEPTEMBER 12, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	2,072	(766)	71	% of Ephemeroptera
20	242	(143)		12
80	25	(26)		1
310	208	(144)		10
810	50	(23)		2
910	13	(9)		1
1210	586	(317)		28
1510	3			*
1610	443	(327)		21
2030	502	(277)		24
2510	*			*
Plecoptera	49	(23)	2	% of Plecoptera
3610	*			*
3710	35	(34)		71
3810	13	(12)		26
4330	1			2
Odonata (4710)	3		*	
Trichoptera	578	(261)	20	% of Trichoptera
6560	422	(197)		73
6630	130	(75)		22
7410	9			2
7710	6			1
7730	11	( )[2]		2
9020	*			*
Chironomidae (all)(10510)	46	(23)	2	
Simuliidae (all)(17510)	105	(63)	4	
Minor Diptera	7		*	
18010	*			
18180	*			
18210	2			
18360	5			
18710	*			
19010	*			
Lepidoptera (19510)	1		*	

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[1] Each replicate was completely processed.

[2] S.D. not available due to processing error.

*Values less than 1.

(continued)

TABLE B-32. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	19	(16)	1	
19720	15	(14)		
19770	3			
19930	*			
20310	1			
20410	*			
Hydracarina	2		*	
21410	1			
21510	1			
21700	*			
21810	*			
Oligochaeta (all)(59010)	27	(12)	1	
Total organisms	2,910	(989)		

*Values less than 1.

TABLE B-33. SITE 115, August 3, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	718	(204)	65	% of Ephemeroptera
20	110	(53)		15
30	5			1
80	6			1
380	8			1
390	1			*
810	52	(17)		7
910	14	(7)		2
1210	266	(79)		37
1510	10			1
1530	2			*
1610	193	(50)		27
2030	52	(28)		7
2510	1			*
Plecoptera (3610)	2		*	
Odonata (4710)	2		*	
Trichoptera	257	(93)	23	% of Trichoptera
6560	225			88
6630	2			1
7410	11	(9)		4
7850	18	(13)		7
Chironomidae (all)(10510)	78	(29)	7	
Simuliidae (all)(17510)	25	(21)	2	
Minor Diptera	3		*	
18360	2			
18710	1			
Coleoptera (19720)	2		*	
Hydracarina (21510)	10	(5)	1	
Oligochaeta (all)(59010)	2		*	
Total organisms	1,099	(319)		

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[1] Each replicate was one-fourth processed.

*Values less than 1.

TABLE B-34. SITE 115, September 15, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	655	(220)	45	% of Ephemeroptera
20	86	(26)		13
80	11	(8)		2
310	91	(63)		14
810	24	(12)		4
910	1			*
1210	109	(49)		17
1510	48	(26)		7
1610	270	(105)		41
2030	15	(5)		2
Plecoptera	17	(4)	1	
3610	1			
3710	6			
3810	10	(5)		
Odonata (4710)	3		*	
Trichoptera	464	(167)	32	% of Trichoptera
6560	370	(153)		80
6630	83	(26)		18
7410	6			1
7730	4			1
9020	1			*
Chironomidae (all)(10510)	234	(98)	16	
Simuliidae (all)(17510)	70	(42)	5	
Minor Diptera (18360)	6		*	
Lepidoptera (19510)	3		*	
Hydracarina (21510)	1		*	
Oligochaeta (all)(59010)	2		*	
Total organisms	1,456	(472)		

[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-35. SITE 115, April 12, 1980 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,844	(390)	79	% of Ephemeroptera
20	69	(24)		4
80	6			*
310	1,254	(278)		68
1210	474	(151)		26
2030	41	(12)		2
Plecoptera	109	(21)	5	% of Plecoptera
3610	6			5
3710	3			3
3820	30	(8)		28
3860	70	(20)		64
Odonata (4710)	2		*	
Trichoptera	178	(101)	8	% of Trichoptera
6560	115	(68)		65
6630	63	(42)		35
Chironomidae (all) (10510)	177	(44)	8	
Simuliidae (all)(17510)	2		*	
Minor Diptera (18360)	2		*	
Lepidoptera (19510)	2		*	
Coleoptera (19720)	2		*	
Hydracarina	8		*	
21410	1			
21510	7			
Oligochaeta (all)(59010)	4		*	
Total organisms	2,330	(494)		

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[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-36. SITE 120, September 17, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,332	(237)	39	% of Ephemeroptera
20	397	(63)		30
80	42	(9)		3
310	108	(48)		8
810	102	(67)		8
1210	258	(64)		19
1220	1			*
1510	6			*
1610	405	(108)		30
2030	14	(10)		1
Plecoptera	73	(32)	2	% of Plecoptera
3610	10			13
3710	7			10
3810	56	(37)		77
Odonata (4710)	2		*	
Trichoptera	1,624	(388)	47	% of Trichoptera
6560	1,363	(363)		84
6630	222	(48)		14
7410	34	(18)		2
7730	2			*
9020	1			*
9030	1			*
9110	1			*
Chironomidae (all) (10510)	235	(174)	7	
Simuliidae (all)(17510)	145	(39)	4	
Minor Diptera (18360)	5		*	
Lepidoptera (19510)	9		*	
Coleoptera	13	(7)	*	
19720	10			
19770	2			
19930	1			

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[1] Each replicate was one-fourth processed.
*Values less than 1.

(continued)

TABLE B-36. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina (21410)	1		*	
Oligochaeta (all)(59010)	1		*	
Total organisms	3,438	(796)		

*Values less than 1.

TABLE B-37. SITE 130, SEPTEMBER 24, 1976 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	2,066 (995)	44	% of Ephemeroptera
20	74 (27)		4
80	3		*
310	582 (249)		28
1030	5		*
1210	133 (95)		6
1610	136 (62)		7
2030	1,132 (667)		55
Plecoptera	216 (157)	5	% of Plecoptera
3610	*		*
3710	4		2
3810	186 (143)		86
4000	3		1
4330	22 (13)		10
Odonata (4710)	8	*	
Trichoptera	852 (576)	18	% of Trichoptera
6560	364 (227)		43
6630	356 (325)		42
7130	10 (6)		1
7410	6		1
7710	107 (84)		13
7730	6		1
8310	3		*
8910	1		*
Chironomidae (all) (10510)	328 (212)	7	
Simuliidae (all)(17510)	32 (26)	1	
Minor Diptera	11 (8)	*	
18210	4		
18240	1		
18360	5		
18710	*		
Lepidoptera (19510)	1	*	

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[1] Each of four replicates was one-fourth processed, and one replicate was one-half processed.

*Values less than 1.

(continued)

TABLE B-37. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	9		*	
19720	2			
19770	6			
20060	1			
Hydracarina	17	(8)	*	
21410	8			
21510	3			
21700	3			
21720	3			
Oligochaeta (all) (59010)	1,169	(924)	25	
Total organisms	4,707	(2,167)		

*Values less than 1.

TABLE B-38. SITE 130, OCTOBER 4, 1977 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	625	(174)	45	% of Ephemeroptera
20	4			1
80	1			*
310	16	(6)		3
1030	*			*
1210	18	(7)		3
1610	197	(50)		31
2030	389	(117)		62
Plecoptera	24	(17)	2	
3710	1			
3810	20	(16)		
4330	3			
4510	1			
Odonata (4710)	2		*	
Trichoptera	558	(359)	41	% of Trichoptera
6560	338	(208)		61
6630	193	(143)		35
7130	4			1
7410	10	(9)		2
7710	9			2
7730	3			1
8310	*			*
9020	1			*
Chironomidae (all)(10510)	66	(24)	5	
Simuliidae (all)(17510)	55	(24)	4	
Minor Diptera	24	(8)	2	
18010	1			
18210	20	(7)		
18360	3			
18450	*			
Lepidoptera (19510)	5		*	

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[1] Each replicate was completely processed.
*Values less than 1.

(continued)

TABLE B-38. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	9	1	
19720	4		
19770	3		
19930	2		
20060	*		
20310	*		
Hydracarina (21510)	1	*	
Oligochaeta (all)(59010)	7	*	
Total organisms	1,375 (509)		

*Values less than 1.

TABLE B-39. SITE 130, APRIL 3, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	980	(473)	60	% of Ephemeroptera
20	2			*
80	1			*
310	267	(108)		27
1210	160	(49)		16
2030	550	(343)		56
Plecoptera	21	(7)	1	
3710	1			
3820	11	(1)		
3880	9			
4000	*			
Odonata	1		*	
4710	1			
5310	*			
Trichoptera	87	(35)	5	% of Trichoptera
6560	47	(17)		54
6630	37	(17)		42
7130	*			*
7710	3			4
9020	*			*
Chironomidae (all)(10510)	359	(94)	22	
Simuliidae (all)(17510)	26	(6)	2	
Minor Diptera	17	(7)	1	
18010	10	(5)		
18180	*			
18210	4			
18240	1			
18360	*			
18810	*			
19490	*			

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-39. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	7		*	
19720	3			
19770	2			
19930	1			
20060	1			
20610	*			
Hydracarina	1		*	
21410	*			
21510	*			
Amphipoda (41060)	*		*	
Oligochaeta (all)(59010)	142	(148)	9	
Total organisms	1,641	(712)		

*Values less than 1.

TABLE B-40. SITE 130, MAY 14, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	313	(204)	48	% of Ephemeroptera
310	125	(73)		40
1210	42	(18)		14
2030	146	(128)		47
Plecoptera	10		1	
3820	9			
3880	1			
Trichoptera	30	(13)	5	
6560	22	(14)		
6630	6			
7130	2			
Chironomidae (all)(10510)	174	(68)	27	
Simuliidae (all)(17510)	8		1	
Minor Diptera	15	(6)	2	
18010	14	(6)		
18210	2			
Coleoptera	3		*	
19720	2			
19770	1			
Hydracarina	16	(11)	2	
21410	7			
21510	9			
Oligochaeta (all)(59010)	86	(77)	13	
Total organisms	654	(359)		

[1] Each replicate was one-fourth processed. These replicates represent collection times of 15 seconds each.

*Values less than 1.

TABLE B-41. SITE 130, July 28, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,510	(163)	65	% of Ephemeroptera
20	69	(26)		5
30	4			*
80	7			*
310	2			*
380	76	(21)		5
910	4			*
1210	1,182	(118)		78
1610	65	(15)		4
2030	101	(37)		7
Plecoptera	8		*	
3610	5			
3710	1			
3810	2			
Odonata (4710)	1		*	
Trichoptera	81	(26)	3	% of Trichoptera
6560	41	(17)		50
6630	1			1
7410	37	(17)		46
7730	1			1
7850	1			1
8910	1			1
Chironomidae (all)(10510)	98	(21)	4	
Simuliidae (all)(17510)	596	(185)	26	
Minor Diptera	2		*	
18010	1			
18210	*			
18360	1			
Coleoptera (19720)	7		*	

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[1] Each of four replicates was one-fourth processed, and one replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-41. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	4		*	
21510	2			
21700	2			
Oligochaeta (all)(59010)	30	(53)	1	
Total organisms	2,337	(330)		

*Values less than 1.

TABLE B-42. SITE 130, SEPTEMBER 12, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	748	(133)	69	% of Ephemeroptera
20	165	(47)		22
80	15	(6)		2
310	16	(4)		2
380	2			*
810	3			*
910	2			*
1210	257	(52)		34
1510	*			*
1610	122	(19)		16
2030	165	(42)		22
Plecoptera	15	(2)	1	
3610	*			
3710	8			
3810	5			
4000	*			
4330	*			
4510	*			
Odonata (4710)	*		*	
Trichoptera	223	(38)	21	% of Trichoptera
6560	130	(23)		58
6630	72	(22)		32
6710	*			*
7130	*			*
7410	13	(8)		6
7710	1			*
7730	6			3
Chironomidae (all)(10510)	12	(6)	1	
Simuliidae (all)(17510)	78	(110)	7	

---

[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-42. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Minor Diptera	3		*	
18010	*			
18360	2			
18710	1			
Coleoptera	2		*	
19720	1			
19770	1			
19930	*			
Oligochaeta (all)(59010)	3		*	
Total organisms	1,084	(170)		

*Values less than 1.

TABLE B-43. SITE 130, April 25, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,275	(270)	93	% of Ephemeroptera
20	20	(19)		2
80	5			*
310	977	(240)		77
1210	149	(41)		12
2030	125	(53)		10
Plecoptera	40	(22)	3	% of Plecoptera
3710	5			12
3810	34	(24)		84
4000	1			2
4560	1			2
Odonata (4710)	3		*	
Trichoptera	21	(17)	2	
6560	10			
6630	10	(8)		
7710	1			
Chironomidae (all)(10510)	14	(6)	1	
Simuliidae (all)(17510)	8		1	
Minor Diptera (18710)	2		*	
Coleoptera	4		*	
19720	2			
19770	1			
19930	1			
20060	1			
Hydracarina	2		*	
21410	1			
21510	1			
Oligochaeta (all)(59010)	9		1	
Total organisms	1,378	(278)		

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[1] Each replicate was one-fourth processed.

*Values less than 1.

TABLE B-44. SITE 130, August 3, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	2,500	(797)	72	% of Ephemeroptera
20	490	(179)		20
30	4			*
80	16	(6)		1
310	10			*
380	66	(16)		3
810	20	(12)		1
910	17	(12)		1
1050	2			*
1210	1,263	(450)		51
1220	1			*
1610	452	(157)		18
2030	160	(80)		6
Plecoptera	22	(13)	1	
3610	9			
3710	10	(7)		
3810	1			
4510	2			
Odonata (4710)	2		*	
Trichoptera	232	(99)	7	% of Trichoptera
6560	174	(91)		75
7410	47	(8)		20
7710	1			*
7850	10	(8)		4
Chironomidae (all)(10510)	98	(61)	3	
Simuliidae (all)(17510)	560	(425)	16	
Minor Diptera	14	(11)	*	
18360	2			
18710	11	(9)		

---

[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-44. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	20	(12)	1	
19720	2			
19770	13	(8)		
19930	5			
Hydracarina (21510)	4		*	
Oligochaeta (all)(59010)	3		*	
Total organisms	3,454	(1,268)		

*Values less than 1.

TABLE B-45. SITE 130, September 15, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,027	(462)	40	% of Ephemeroptera
20	358	(166)		35
80	1			*
310	37	(39)		4
380	1			*
810	27	(17)		3
910	1			*
1210	295	(160)		29
1510	1			*
1610	293	(112)		29
2030	14	(10)		1
Plecoptera	44	(28)	2	% of Plecoptera
3610	21	(9)		47
3710	18	(12)		40
3810	2			5
4330	1			2
4510	2			5
Odonata (4710)	1		*	
Trichoptera	350	(216)	14	% of Trichoptera
6560	290	(177)		83
6630	30	(25)		8
6710	1			*
7410	25	(15)		7
7710	2			*
7730	4			1
Chironomidae (all) (10510)	820	(588)	32	
Simuliidae (all)(17510)	317	(201)	12	
Minor Diptera	34	(18)	1	
18360	21	(8)		
18710	13	(13)		

---

[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-45. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	2	*	
19720	1		
19770	1		
19930	1		
Total organisms	2,595 (1,422)		

*Values less than 1.

TABLE B-46. SITE 130, April 11, 1980 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,459	(995)	72	% of Ephemeroptera
20	106	(36)		7
310	958	(693)		66
320	1			*
1030	1			*
1210	387	(272)		27
2030	6			*
Plecoptera	64	(41)	3	% of Plecoptera
3610	5			8
3710	23	(7)		36
3820	20	(20)		31
3880	16	(16)		25
Trichoptera	63	(45)	3	% of Trichoptera
6560	56	(38)		89
6630	7			11
Chironomidae (all) (10510)	430	(151)	21	
Simuliidae (all) (17510)	10	(12)	1	
Minor Diptera	7		*	
18360	3			
18710	4			
Coleoptera	2		*	
19770	1			
19930	1			
Hydracarina (21510)	2		*	
Oligochaeta (all)(59010)	1		*	
Total organisms	2,038	(1,218)		

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[1] Each replicate was one-fourth processed.
*Values less than 1.

TABLE B-47. SITE 140, SEPTEMBER 24, 1976 (10 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,206	(382)	54	% of Ephemeroptera
20	10	(5)		1
80	17	(7)		1
310	682	(286)		57
810	*			*
910	1			*
1030	15	(12)		1
1210	52	(24)		4
1510	4			*
1610	35	(14)		3
2030	391	(117)		32
Plecoptera	81	(60)	4	% of Plecoptera
3710	2			2
3810	72	(56)		89
3880	*			*
4000	2			2
4330	5	(6)		6
4560	*			*
Odonata	2		*	
4710	2			
5500	*			
Trichoptera	569	(392)	25	% of Trichoptera
6560	146	(90)		26
6630	245	(207)		43
6710	*			*
7130	2			*
7410	6	(5)		1
7710	167	(118)		29
7730	*			*
8310	3			*
8910	1			*
9020	*			*
Chironomidae (all)(10510)	299	(138)	13	
Simuliidae (all)(17510)	4		*	

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[1] Each of nine replicates was completely processed, and one replicate was one-half processed.

*Values less than 1.

(continued)

TABLE B-47. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Minor Diptera	7	(4)	*	
18010	1			
18210	*			
18240	1			
18360	2			
18710	3			
Lepidoptera (19510)	*		*	
Coleoptera	15	(7)	1	
19720	2			
19770	9	(5)		
19930	3			
20060	1			
Hydracarina	10	(7)	*	
21410	7	(5)		
21510	2			
21700	1			
21720	*			
Oligochaeta (all)(59010)	44	(80)	2	
Total organisms	2,236	(886)		

*Values less than 1.

TABLE B-48. SITE 140, OCTOBER 5, 1977 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	556	(112)	71	% of Ephemeroptera
20	96	(32)		17
80	18	(9)		3
310	26	(5)		5
810	1			*
1030	1			*
1210	5			1
1510	*			*
1610	71	(16)		13
2030	337	(76)		61
Plecoptera	28	(10)	4	
3610	3			
3710	6			
3810	10			
3880	*			
4000	*			
4330	7			
4510	*			
Trichoptera	119	(31)	15	% of Trichoptera
6560	43	(12)		36
6630	71	(17)		60
7130	*			*
7710	4			4
9020	1			1
Chironomidae (all) (10510)	50	(27)	6	
Smmuliidae (all)(17510)	9		1	
Minor Diptera	3		*	
18210	3			
18360	1			
Coleoptera	3		*	
19720	1			
19770	2			
19930	1			
20060	*			

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-48. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	1		*	
21410	*			
21510	1			
Oligochaeta (all)(59010)	9		1	
Total organisms	777	(183)		

*Values less than 1.

TABLE B-49. SITE 140, APRIL 3, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	103	(37)	57	% of Ephemeroptera
20	6			5
310	22	(8)		22
1210	72	(30)		70
2030	2			2
Plecoptera	13	(5)	7	
3710	*			
3820	13	(5)		
3880	*			
Trichoptera	3		1	
6560	2			
6630	*			
7710	*			
Chironomidae (all)(10510)	20	(8)	11	
Simuliidae (all)(17510)	10	(7)	6	
Coleoptera	*		*	
19770	*			
19930	*			
Oligochaeta (all)(59010)	31	(27)	17	
Total organisms	181	(57)		

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[1] Each replicate was completely processed.

*Values less than 1.

TABLE B-50. SITE 140, MAY 16, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	47	(38)	32	% of Ephemeroptera
20	1			3
310	16	(17)		34
650	1			2
1210	18	(15)		38
2030	11	(8)		24
Plecoptera	5		3	
3820	4			
3880	*			
Odonata (5610)	*		*	
Trichoptera	5		4	
6560	2			
6630	2			
7710	1			
8310	*			
Chironomidae (all) (10510)	57	(22)	39	
Simuliidae (all)(17510)	4		2	
Minor Diptera	3		2	
18010	1			
18020	1			
18180	*			
19370	*			
Lepidoptera (19510)	*		*	
Coleoptera	2		2	
19720	*			
19770	1			
19930	1			
20920	*			
Hydracarina (21510)	*		*	
Oligochaeta (all)(59010)	21	(8)	15	
Total organisms	146	(62)		

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[1] Each replicate was one-half processed.

*Values less than 1.

TABLE B-51. SITE 140, JULY 28, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,309	(164)	71	% of Ephemeroptera
20	35	(7)		3
30	17	(4)		1
80	8			1
310	*			*
320	*			*
380	128	(26)		10
910	9			1
1210	960	(117)		73
1220	1			*
1610	36	(6)		3
2030	116	(24)		9
2510	*			*
Plecoptera	8		*	
3610	*			
3710	4			
3820	*			
3880	2			
4510	1			
Trichoptera	50	(15)	3	% of Trichoptera
6560	18	(6)		35
6630	1			1
7410	21	(9)		42
7710	*			*
7730	9			13
7850	1			2
7860	*			*
Chironomidae (all)(10510)	81	(12)	4	
Simuliidae (all)(17510)	368	(77)	20	
Minor Diptera	2		*	
18010	1			
18210	*			
18240	*			
18710	1			

---

[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-51. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	10	(5)	1	
19720	5			
19770	3			
19930	2			
Hydracarina	6		*	
21410	2			
21510	4			
Oligochaeta (all)(59010)	19	(21)	1	
Total organisms	1,853	(229)		

*Values less than 1.

TABLE B-52. SITE 140, September 14, 1978 (15 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,409	(474)	69	% of Ephemeroptera
20	443	(177)		31
80	22	(10)		2
310	187	(150)		13
380	2			*
810	2			*
910	*			*
1030	*			*
1210	378	(138)		27
1610	52	(21)		4
2030	322	(139)		23
Plecoptera	35	(14)	2	% of Plecoptera
3610	2			6
3710	18	(7)		52
3810	14	(11)		40
4330	*			1
4510	*			1
Odonata (4710)	2		*	
Trichoptera	399	(151)	20	% of Trichoptera
6560	237	(90)		59
6630	128	(54)		32
7130	1			*
7150	*			*
7410	27	(10)		7
7710	*			*
7730	5	(5)		1
8910	*			*
9020	*			*
Chironomidae (all)(10510)	21	(12)	1	
Simuliidae (all)(17510)	117	(48)	6	
Minor Diptera	26	(9)	1	% of Minor Diptera
18210	1			5
18360	7	(4)		28
18710	17	(6)		67
18820	*			*

---

[1] Each replicate was completely processed.
*Values less than 1.

(continued)

TABLE B-52. (Continued)

Taxon (See Appendix A)	Mean Count Per Replicate (S.D.)		Percent of Total Organisms	Composition of Important Groups
Lepidoptera (1951	*		*	
Coleoptera	22	(9)	1	% of Coleoptera
19720	5	(3)		20
19770	14	(6)		64
19930	3			14
20060	*			1
20410	*			1
Hydracarina	4	(3)	*	
21410	1			
21510	2			
21700	1			
21980	*			
Oligochaeta (all)(59010)	1		*	
Total organisms	2,036	(675)		

*Values less than 1.

TABLE B-53. SITE 140, April 25, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	602	(123)	88	% of Ephemeroptera
20	36	(22)		6
80	2			*
310	464	(122)		77
1210	71	(20)		12
2030	28	(9)		5
Plecoptera	15	(4)	2	
3610	1			
3710	*			
3810	13	(3)		
4000	*			
Trichoptera	12	(6)	2	
6560	8			
6630	4			
7410	*			
Chironomidae (all)(10510)	8		1	
Simuliidae (all)(17510)	5		1	
Minor Diptera	8		1	
18240	*			
18360	2			
18710	5			
19490	*			
Coleoptera	7		1	
19720	1			
19770	4			
19930	2			
Hydracarina	1		*	
21410	*			
21510	1			
Oligochaeta (all)(59010)	26	(14)	4	
Total organisms	684	(142)		

[1] Each replicate was one-half processed.

*Values less than 1.

TABLE B-54. SITE 140, August 3, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	2,339	(714)	80	% of Ephemeroptera
20	179	(49)		8
30	42	(21)		2
80	38	(20)		2
310	9			*
320	1			*
380	190	(44)		8
390	1			*
810	20	(3)		1
910	21	(13)		1
1050	6			*
1210	1,206	(382)		52
1220	6			*
1510	1			*
1610	388	(155)		17
2030	232	(91)		10
Plecoptera	26	(17)	1	
3610	7			
3710	16	(16)		
3810	1			
4510	2			
Trichoptera	216	(41)	7	% of Trichoptera
6560	146	(40)		68
7410	51	(17)		24
7850	16	(9)		7
7860	1			*
8910	2			1
Chironomidae (all)(10510)	151	(40)	5	
Simuliidae (all)(17510)	163	(99)	6	
Minor Diptera	30	(18)	1	
18360	2			
18710	27	(18)		

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-54. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	9		*	
19720	3			
19770	3			
19930	2			
20450	1			
Hydracarina (21510)	1		*	
Total organisms	2,934	(881)		

*Values less than 1.

TABLE B-55. SITE 140, September 15, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,622	(635)	51	% of Ephemeroptera
20	423	(241)		26
80	50	(34)		3
310	304	(198)		19
380	1			*
810	12	(9)		1
910	4			*
1030	7			*
1210	486	(89)		30
1220	1			*
1510	3			*
1610	266	(72)		16
2030	64	(32)		4
Plecoptera	71	(47)	2	% of Plecoptera
3610	2			3
3710	9			12
3810	54	(41)		76
4330	5			7
4510	1			1
Odonata (4710)	2		*	
Trichoptera	538	(187)	17	% of Trichoptera
6560	375	(152)		70
6630	109	(41)		20
7410	34	(7)		6
7730	16	(14)		3
8910	4			1
Chironomidae (all)(10510)	347	(115)	11	
Simuliidae (all)(17510)	547	(206)	17	
Minor Diptera (18710)	18	(12)	1	
Coleoptera	10	(8)	*	
19720	3			
19770	4			
19930	3			

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-55. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Hydracarina	3	*	
21510	2		
21700	1		
Oligochaeta (all)(59010)	3	*	
Total organisms	3,162 (1,091)		

*Values less than 1.

TABLE B-56. SITE 140, April 11, 1980 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	5,016	(1840)	77	% of Ephemeroptera
20	41	(26)		1
80	6			*
310	3,759	(1320)		75
320	1			*
1030	1			*
1210	1,126	(524)		22
2030	83	(29)		2
Plecoptera	172	(73)	3	% of Plecoptera
3610	6			3
3710	12	(9)		7
3820	62	(39)		36
3880	92	(37)		53
4560	1			*
Odonata (4710)	5		*	
Trichoptera	337	(167)	5	% of Trichoptera
6560	224	(132)		67
6630	101	(47)		30
6710	1			*
7410	7			2
8310	2			*
8910	2			1
Chironomidae (all)(10510)	926	(282)	14	
Simuliidae (all)(17510)	9		*	
Minor Diptera	26	(15)	*	
18210	1			
18240	1			
18360	2			
18710	22	(13)		

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[1] Each replicate was one-fourth processed.
*Values less than 1.

(continued)

TABLE B-56. (Continue)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	9		*	
19720	2			
19770	3			
19930	4			
Hydracarina	10	(4)	*	
21410	5			
21510	5			
21700	1			
Oligochaeta (all)(59010)	5		*	
Total organisms	6,514	(2,227)		

*Values less than 1.

TABLE B-57. SITE 160, SEPTEMBER 17, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	465	(168)	36	% of Ephemeroptera
20	144	(53)		31
30	1			*
80	19	(10)		4
310	127	(59)		27
320	2			1
380	3			1
810	1			*
910	1			*
1210	96	(58)		21
1610	39	(16)		8
2030	31	(25)		7
Plecoptera	36	(25)	3	
3710	5			
3810	29	(21)		
4140	1			
4330	2			
Trichoptera	194	(73)	15	% of Trichoptera
6560	93	(45)		48
6630	70	(27)		36
6710	1			*
7410	20	(10)		10
7730	10			5
8310	2			1
Chironomidae (all) (10510)	438	(111)	34	
Simuliidae (all)(17510)	131	(84)	10	
Minor Diptera (18710)	3		*	
Coleoptera	7		1	
19720	2			
19770	2			
19930	3			
Hydracarina (2170	8		1	

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-57. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Oligochaeta (all)(59010)	15	(7)	1	
Total organisms	1,298	(417)		

*Values less than 1.

TABLE B-58. SITE 170, SEPTEMBER 14, 1976 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	926	(177)	48	% of Ephemeroptera
20	44	(36)		5
80	4			*
310	468	(74)		51
320	3			*
1030	51	(14)		6
1210	315	(201)		34
1610	4			*
2030	37	(25)		4
Plecoptera	101	(23)	5	% of Plecoptera
3710	17	(6)		17
3810	67	(28)		66
4000	16			16
4330	*			*
4510	1			1
Trichoptera	346	(174)	18	% of Trichoptera
6560	129	(61)		37
6630	124	(66)		36
6710	3			1
7410	8			2
7710	44	(44)		13
8310	38	(21)		11
8910	*			*
Chironomidae (all) (10510)	284	(240)	15	
Simuliidae (all)(17510)	12		1	
Minor Diptera	14		1	
18180	1			
18210	1			
18360	4			
18710	9			
Coleoptera	81	(13)	4	% of Coleoptera
19770	42	(19)		52
19930	39	(7)		48

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[1] Each of two replicates was one-fourth processed, and one replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-58. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	7		*	
21470	1			
21510	3			
21700	3			
Oligochaeta (all)(59010)	156	(253)	8	
Gastropoda (64310)	7		*	
Total organisms	1,934	(271)		

*Values less than 1.

TABLE B-59. SITE 170, SEPTEMBER 17, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	419	(108)	27	% of Ephemeroptera
20	87	(27)		21
80	3			1
310	226	(68)		54
1030	3			1
1050	1			*
1210	74	(60)		18
1610	9			2
2030	16	(7)		4
Plecoptera	26	(4)	2	
3710	6			
3810	18	(5)		
4000	1			
4330	1			
4560	1			
Odonata (4710)	1		*	
Trichoptera	589	(89)	37	% of Trichoptera
6560	245	(87)		42
6630	166	(26)		28
6710	4			1
7410	141	(60)		24
7710	4			1
7730	7			1
8310	14	(9)		2
8910	6			1
9030	1			*
Chironomidae (all) (10510)	304	(333)	19	
Simuliidae (all)(17510)	184	(306)	12	
Minor Diptera	10	(8)	1	
18360	3			
18710	7			

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-59. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	35	(26)	2	
19770	10	(10)		
19930	25	(18)		
Hydracarina	6		*	
21410	1			
21510	4			
21700	2			
Oligochaeta (all)(59010)	3		*	
Total organisms	1,578	(508)		

*Values less than 1.

TABLE B-60. SITE 180, OCTOBER 3, 1977 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	204	(77)	6	% of Ephemeroptera
230	*			*
310	189	(73)		92
1030	3			1
1210	10			5
1610	*			*
2030	2			1
Plecoptera	45	(38)	1	
3710	3			
3810	16			
4000	6			
4510	12			
4560	8			
Trichoptera	1,910	(1,398)	60	% of Trichoptera
6560	33	(24)		2
6710	5			*
7410	1,827	(1,373)		96
7710	37	(23)		2
7730	1			*
8310	4			*
8910	2			*
9110	1			*
Chironomidae (all)(10510)	306	(134)	10	
Simuliidae (all)(17510)	23	(22)	1	
Minor Diptera	89	(57)	3	% of Minor Diptera
18010	2			2
18180	2			2
18210	3			3
18240	2			3
18360	2			3
18450	2			2
18710	76	(54)		86

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[1] Each of two replicates was completely processed, and one replicate was one-fourth processed. These replicates represent collection times of 60 seconds each.

*Values less than 1.

(continued)

TABLE B-60. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	566	(323)	18	% of Coleoptera
19770	140	(75)		25
19930	426	(249)		75
Hydracarina	2		*	
21510	1			
21700	1			
Oligochaeta (all)(59010)	13		*	
Gastropoda (64310)	15		*	
Total organisms	3,173	(2,021)		

*Values less than 1.

TABLE B-61. SITE 180, September 17, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	610	(239)	35	% of Ephemeroptera
20	15	(15)		2
310	241	(119)		39
320	6			1
1030	5			1
1210	326	(130)		53
1610	13	(9)		2
2030	4			1
Plecoptera	26	(11)	2	
3610	2			
3710	10	(4)		
3810	5			
4000	7			
4510	2			
Trichoptera	186	(75)	11	% of Trichoptera
6560	31	(16)		17
6630	1			*
6710	2			1
7410	71	(78)		38
7710	7			4
7730	36	(5)		19
8310	1			*
8910	24	(11)		13
9030	6			3
9110	7			4
Chironomidae (all)(10510)	745	(171)	43	
Simuliidae (all)(17510)	36	(34)	2	
Minor Diptera	6		*	
18360	2			
18710	3			
Coleoptera	91	(9)	5	% of Coleoptera
19770	34	(13)		38
19930	57	(12)		62

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-61. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	7		*	
21410	1			
21510	2			
21700	5			
Oligochaeta (all)(59010)	14	(10)	1	
Total organisms	1,722	(452)		

*Values less than 1.

TABLE B-62. SITE 190, September 16, 1976 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	482 (201)	17	% of Ephemeroptera
20	1		*
310	286 (93)		59
320	27 (5)		6
1030	15		3
1210	135 (121)		28
1610	4		1
2030	15		3
Plecoptera	71 (28)	2	% of Plecoptera
3530	*		*
3710	14		20
3810	25 (4)		35
4000	25 (14)		35
4510	6		8
Trichoptera	538 (430)	19	% of Trichoptera
6560	286 (211)		53
6630	2		*
6710	10		2
7410	180 (165)		33
7710	3		1
8310	27 (20)		5
8910	23 (13)		4
9030	3		*
9110	6		1
Chironomidae (all) (10510)	1,397 (855)	48	
Simuliidae (all) (17510)	7	*	
Minor Diptera	33 (22)	1	
18010	*		
18210	5		
18240	3		
18360	9		
18450	4		
18710	12		
19370	1		

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-62. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	211 (151)	7	% of Coleoptera
19720	*		*
19770	20 (15)		9
19930	191 (136)		91
Hydracarina	1	*	
21510	*		
21700	*		
Amphipoda (41060)	1	*	
Oligochaeta (all)(59010)	156 (149)	5	
Total organisms	2,898 (1,580)		

*Values less than 1.

TABLE B-63. SITE 220, SEPTEMBER 16, 1976 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	350	(137)	26	% of Ephemeroptera
20	2			1
230	2			*
310	260	(103)		74
320	21	(12)		6
1030	26	(10)		7
1210	36	(11)		10
1610	1			*
2030	2			1
Plecoptera	170	(67)	13	% of Plecoptera
3610	*			*
3710	31	(0)		18
3810	29	(6)		17
4000	97	(68)		57
4510	13			8
Trichoptera	283	(17)	21	% of Trichoptera
6560	117	(10)		41
6710	13			5
7410	87	(15)		31
7710	3			1
8310	28	(13)		10
8910	34	(19)		12
9110	1			*
Chironomidae (all)(10510)	165	(24)	12	
Simuliidae (all)(17510)	2		*	
Minor Diptera	20	(8)	1	
18180	3			
18240	3			
18360	6			
18450	5			
18710	3			

---

[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-63. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	323	(135)	24	% of Coleoptera
19770	33	(7)		10
19930	290	(130)		90
Hydracarina	1		*	
21410	*			
21510	1			
21700	*			
Oligochaeta (all)(59010)	40	(30)	3	
Total organisms	1,355	(344)		

*Values less than 1.

TABLE B-64. SITE 230, OCTOBER 3, 1977 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	670 (330)	12	% of Ephemeroptera
230	8		1
310	413 (210)		62
320	5		1
1030	44 (18)		7
1210	190 (90)		28
1610	9		1
2030	*		*
Plecoptera	190 (36)	3	% of Plecoptera
3530	1		1
3610	1		1
3710	5		2
3810	3		2
4000	168 (28)		88
4510	11		6
4560	1		1
Trichoptera	1,415 (262)	24	% of Trichoptera
6560	35 (26)		2
6630	2		*
6710	13		1
7130	*		*
7180	2		*
7410	1,252 (243)		88
8310	47 (22)		3
8910	51 (38)		4
9030	1		*
9110	12		1
9560	*		*
Chironomidae (all)(10510)	149 (56)	3	
Simuliidae (all)(17510)	73 (83)	1	
Minor Diptera	48 (18)	1	
18010	1		
18210	3		
18240	24 (18)		
18360	18 (54)		
18450	*		
18710	1		

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[1] Each of two replicates was one-fourth processed, and one replicate was completely processed. These replicates represent collection times of 60 seconds each.

*Values less than 1.

(continued)

TABLE B-64. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	2,947	(455)	51	% of Coleoptera
19770	251	(66)		9
19930	2,696	(398)		91
Hydracarina	292	(18)	5	% of Hydracarina
21410	22	(12)		7
21470	6			2
21480	9			3
21510	213	(34)		73
21640	1			*
21700	1			*
21720	39	(23)		13
Oligochaeta (all)(59010)	1		*	
Gastropoda	32	(10)	1	
63410	4			
63810	*			
64310	28	(10)		
Total organisms	5,816	(1,203)		

*Values less than 1.

TABLE B-65. SITE 230, APRIL 4, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	695	(169)	39	% of Ephemeroptera
230	3			*
310	282	(104)		40
320	3			*
1030	15	(2)		2
1210	392	(88)		56
2030	1			*
Plecoptera	27	(5)	2	
3530	*			
3610	*			
3710	2			
3820	5			
3850	*			
4000	19	(4)		
4090	*			
Trichoptera	127	(72)	7	% of Trichoptera
6560	1			1
6630	2			1
6710	*			*
7410	23	(10)		18
7710	87	(53)		69
8310	2			2
8910	11	(8)		9
9110	*			*
Chironomidae (all)(10510)	705	(151)	39	
Simuliidae (all)(17510)	19	(23)	1	
Minor Diptera	14	(12)	1	
18010	2			
18180	5			
18210	*			
18240	5			
18360	1			
18410	*			
18450	1			

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-65. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	102	(95)	6	% of Coleoptera
19770	4			4
19930	98	(91)		96
Hydracarina	1		*	
21410	*			
21510	1			
Amphipoda (41060)	*		*	
Oligochaeta (all)(59010)	83	(83)	5	
Gastropoda	25	(14)	1	
63410	1			
64310	24	(14)		
Total organisms	1,798	(314)		

*Values less than 1.

TABLE B-66. SITE 230, May 18, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	1,485 (1,192)	77	% of Ephemeroptera
20	1		*
230	8		1
310	306 (179)		21
320	11 (12)		1
1010	2		*
1210	1,142 (967)		77
1220	14 (24)		1
1610	1		*
2030	1		*
Plecoptera	20 (10)	1	
3530	1		
3610	2		
3710	2		
3810	4		
4000	6		
4510	4		
4560	2		
Trichoptera			
7410	14 (15)		22
8310	2		2
8910	42 (26)		65
9030	1		1
9110	2		4
9560	3		5
Chironomidae (all)(10510)	171 (144)	9	
Simuliidae (all)(17510)	26 (22)	1	

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[1] Each replicate was one-fourth processed.
*Values less than 1.

(continued)

TABLE B-66. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Minor Diptera	19	(15)	1	
18010	2			
18180	2			
18210	2			
18240	8			
18360	2			
18450	1			
18710	1			
19220	1			
Coleoptera	124	(62)	6	% of Coleoptera
19770	20	(6)		16
19930	103	(59)		83
20900	1			1
Hydracarina	2		*	
21410	1			
21510	1			
Oligochaeta (all)(59010)	21	(10)	1	
Gastropoda (63400)	1		*	
Total organisms	1,934	(1,463)		

*Values less than 1.

TABLE B-67. SITE 230, July 28, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	418 (181)	16	% of Ephemeroptera
20	7		2
230	3		1
310	2		1
320	7		2
390	2		*
1010	1		*
1210	348 (146)		83
1610	49 (33)		12
Plecoptera	39 (21)	1	
3530	*		
3710	28 (15)		
4000	1		
4190	1		
4510	8		
4560	1		
Trichoptera	244 (115)	9	% of Trichoptera
6710	2		1
7410	139 (58)		57
8910	103 (71)		42
9030	1		*
Chironomidae (all)(10510)	124 (33)	5	
Simuliidae (all)(17510)	1,681 (780)	63	
Minor Diptera	16 (10)	1	
18240	1		
18360	6		
18710	2		
18720	3		
18740	2		
18780	3		
Coleoptera	144 (76)	5	% of Coleoptera
19770	22 (18)		15
19930	122 (59)		85
20310	*		*

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[1] Each of four replicates was one-fourth processed, and one replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-67. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina (21510)	2		*	
Oligochaeta (all)(59010)	2		*	
Total organisms	2,671	(975)		

*Values less than 1.

TABLE B-68. SITE 230, SEPTEMBER 14, 1978 (15 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	684	(351)	10	% of Ephemeroptera
20	52	(17)		8
230	*			*
310	248	(184)		36
320	9	(5)		1
330	1			*
1030	5	(3)		1
1210	359	(165)		52
1220	*			*
1610	8	(7)		1
2030	2			*
Plecoptera	154	(50)	2	% of Plecoptera
3530	1			1
3610	6	(2)		4
3710	103	(34)		67
3810	1			1
4000	25	(13)		16
4090	*			*
4510	18	(7)		12
4560	1			1
Trichoptera	592	(238)	9	% of Trichoptera
6560	19	(5)		3
6630	*			*
6710	2			*
7410	512	(216)		86
7710	*			*
8910	52	(23)		9
9110	6	(2)		1
9510	*			*
9530	*			*
Chironomidae (all)(10510)	150	(74)	2	
Simuliidae (all)(17510)	5,074	(2,072)	73	

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-68. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Minor Diptera	23	(10)	*	% of Minor Diptera
18010	*			1
18180	*			1
18240	2			11
18360	5	(3)		21
18450	*			*
18710	5	(3)		22
18720	10	(9)		44
Coleoptera	224	(88)	3	% of Coleoptera
19720	2			1
19770	106	(62)		47
19930	116	(37)		52
Hydracarina	11	(8)	*	
21410	*			
21510	9	(7)		
21550	*			
21700	1			
21720	*			
Amphipoda (41060)	*		*	
Oligochaeta (all)(59010)	*		*	
Total organisms	6,913	(2,508)		

*Values less than 1.

TABLE B-69. SITE 230, September 15, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	575	(108)	32	% of Ephemeroptera
20	88	(43)		15
80	2			*
310	67	(35)		12
320	12	(6)		2
1030	12	(6)		2
1210	384	(64)		67
1220	1			*
1610	9			2
2030	1			*
Plecoptera	95	(34)	5	% of Plecoptera
3610	10	(8)		11
3710	43	(21)		45
3810	2			2
4000	23	(11)		24
4510	17	(13)		18
Trichoptera	497	(273)	28	% of Trichoptera
6560	51	(28)		10
6710	3			1
7410	384	(286)		77
8910	51	(12)		10
9030	2			*
9110	5			1
Chironomidae (all)(10510)	250	(111)	14	
Simuliidae (all)(17510)	73	(53)	4	
Minor Diptera	20	(6)	1	
18240	2			
18360	15	(5)		
18710	3			
Coleoptera	260	(109)	15	% of Coleoptera
19770	98	(44)		38
19930	162	(70)		62

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-69. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	7		*	
21410	1			
21510	6			
21700	1			
Total organisms	1,777	(277)		

*Values less than 1.

TABLE B-70. SITE 290, OCTOBER 3, 1977 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	231	(40)	19	% of Ephemeroptera
20	28	(6)		12
120	*			*
310	99	(34)		43
320	57	(13)		25
330	14			6
1030	16			7
1210	15			7
1610	2			1
Plecoptera	34	(15)	3	
3530	*			
3610	9			
3710	5			
3810	2			
4000	13			
4510	5			
4560	1			
Trichoptera	653	(150)	54	% of Trichoptera
6560	80	(39)		12
6710	19	(11)		3
7410	109	(44)		17
8630	5			1
8910	392	(157)		60
9110	41	(124)		6
9530	6			1
Chironomidae (all)(10510)	141	(64)	12	
Simuliidae (all)(17510)	*		*	
Minor Diptera	37	(12)	3	
18180	2			
18240	5			
18360	4			
18450	8			
18710	7			
18720	10			
18740	1			

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[1] Each replicate was completely processed. These replicates represent collection times of 60 seconds each.

*Values less than 1.

(continued)

TABLE B-70. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	116 (48)	10	% of Coleoptera
19770	9		8
19870	*		*
19930	105 (43)		91
20010	1		1
20440	*		*
Hydracarina (21510)	4	*	
Oligochaeta (all)	4	*	
Total organisms	1,219 (227)		

*Values less than 1.

TABLE B-71. SITE 290, September 13, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	150 (26)	22	% of Ephemeroptera
20	22 (19)		14
310	27 (7)		18
320	21 (10)		14
330	2		2
1030	3		2
1210	70 (19)		46
1610	6		4
Plecoptera	8	1	
3710	2		
3810	2		
4000	1		
4510	4		
Trichoptera	302 (194)	44	% of Trichoptera
6560	10		3
6710	4		1
7410	38 (46)		13
8630	2		1
8910	146 (120)		49
9110	101 (47)		33
9530	1		*
Chironomidae (all)(10510)	15 (10)	2	
Simuliidae (all)(17510)	126 (149)	18	
Minor Diptera	12 (8)	2	
18240	2		
18360	1		
18710	4		
18740	6		

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-71. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	64	(28)	9	% of Coleoptera
19770	12	(5)		19
19870	1			1
19930	50	(24)		79
20410	1			1
Hydracarina	13	(6)	2	
21410	2			
21510	9			
21550	1			
21700	1			
Oligochaeta (all)(59010)	1		*	
Total organisms	690	(153)		

*Values less than 1.

TABLE B-72. SITE 290, SEPTEMBER 17, 1979 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	170	(49)	16	% of Ephemeroptera
20	57	(20)		33
310	9			5
320	52	(14)		31
330	1			*
1030	6			3
1210	43	(20)		25
1610	3			2
Plecoptera	13	(7)	1	
3710	2			
4000	6			
4510	6			
Trichoptera	666	(125)	62	% of Trichoptera
6560	24	(6)		4
6710	13	(7)		2
7410	107	(28)		16
8910	185	(49)		28
9110	333	(117)		50
9530	4			1
Chironomidae (all)(10510)	25	(7)	2	
Simuliidae (all)(17510)	9		1	
Minor Diptera	74	(11)	7	% of Minor Diptera
18240	2			3
18360	10	(6)		14
18450	1			1
18710	59	(11)		80
18740	1			1
Coleoptera	99	(26)	9	% of Coleoptera
19770	15	(11)		15
19870	1			1
19930	83	(17)		84

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[1] Each replicate was one-fourth processed.

*Values less than 1.

(continued)

TABLE B-72. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Hydracarina	16	(9)	1	
21510	15	(9)		
21700	1			
Oligochaeta (all)(59010)	2		*	
Pelecypoda (65010)	1		*	
Total organisms	1,074	(171)		

*Values less than 1.

TABLE B-73. SITE 300, OCTOBER 3, 1977 (3 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate,	(S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	223	(50)	9	% of Ephemeroptera
20	13			6
310	38	(24)		17
320	73	(32)		33
330	7			3
1030	53	(16)		24
1210	39	(27)		17
1610	1			*
Plecoptera	44	(14)	2	
3530	3			
3810	4			
4000	29	(8)		
4510	8			
Trichoptera	1,536	(804)	65	% of Trichoptera
6560	55	(15)		4
6710	12			1
7410	82	(16)		5
8630	13			1
8910	1,097	(928)		71
9030	4			*
9060	*			*
9110	241	(136)		16
9530	32	(18)		2
Chironomidae (all)(10510)	175	(61)	7	
Simuliidae (all)(17510)	1		*	
Minor Diptera	46	(19)	2	
18010	*			
18240	19	(10)		
18360	2			
18450	16			
18710	2			
18720	5			
19220	2			

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[1] Each of two replicates was one-fourth processed, and one replicate was completely processed. These replicates represent collection times of 60 seconds each.

*Values less than 1.

(continued)

TABLE B-73. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Coleoptera	333 (40)	14	% of Coleoptera
19770	61 (12)		18
19930	272 (34)		82
Hydracarina	5	*	
21410	*		
21510	4		
21700	*		
Oligochaeta (all)(59010)	1	*	
Total organisms	2,365 (849)		

*Values less than 1.

TABLE B-74. SITE 350, SEPTEMBER 13, 1978 (5 Replicates[1])

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)	Percent of Total Organisms	Composition of Important Groups
Ephemeroptera	282 (174)	19	% of Ephemeroptera
20	86 (116)		31
310	84 (13)		30
320	13 (12)		5
330	13 (7)		5
500	1		*
1030	2		1
1210	56 (39)		20
1610	26 (11)		9
Plecoptera	33 (19)	2	
3710	1		
3810	2		
4000	6		
4090	2		
4510	22 (13)		
Trichoptera	200 (88)	13	% of Trichoptera
6560	19 (12)		10
6710	13 (4)		6
7410	43 (14)		22
8630	2		1
8910	92 (60)		46
9060	2		1
9110	28 (32)		14
9510	1		*
9530	1		*
Chironomidae (all)(10510)	62 (18)	4	
Simuliidae (all)(17510)	838 (465)	56	
Minor Diptera	56 (37)	4	% of Minor Diptera
18240	5		9
18360	2		3
18740	34 (13)		61
18780	1		1
19220	14 (13)		26

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[1] Each replicate was completely processed.

*Values less than 1.

(continued)

TABLE B-74. (Continued)

Taxon (See Appendix A.)	Mean Count Per Replicate, (S.D.)		Percent of Total Organisms	Composition of Important Groups
Coleoptera	25	(15)	2	
19770	5			
19870	6			
19930	14	(10)		
Hydracarina	13	(8)	1	
21510	6			
21550	1			
21640	1			
21700	6			
Total organisms	1,508	(725)		

*Values less than 1.